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LIST OF CONTRIBUTORS.

SOME GENERA AND SPECIES OF THE ASTERINIDAE.

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(Plates i–v.)

THIS contribution contains descriptions of seven new species and one new genus, discussions on the grouping of various species within the family, notes on the status of *Habroporina pulchella* H. L. Clark, and opinions on the validity of the sub-family Tremasterinae.

All the specimens referred to herein are housed in the Australian Museum, Sydney, unless stated to the contrary.

Asterina scobinata sp. nov.

(Pl. v, figs 9–12, and 15.)

Description.—Body moderately and evenly elevated. Rays five, tapering evenly from the disc and terminating fairly acutely. R. = 11 mm., r. = 6 mm.; R. = 1.8 r. Interbrachial arcs angular, fairly acute.

The abactinal plates are regularly arranged, crescentic, imbricated, and of more or less even size. Those on each midradial region form a distinct area of three longitudinal rows. These plates are slightly larger than their neighbours, less crescentic, and overlap one another edgeways to a greater degree.

Low down near the margin in the inter-radial region the abactinal plates are nearly circular, not crescentic, and only slightly imbricated. The raised crescentic surface of each abactinal plate does not lie at an angle; it stands straight and upright, and is armed with a large number of delicate minute spinelets, about ten to twenty in number according to the size of the crescentic surface to be covered. These spinelets, being very small and delicate, are easily dislodged when the specimen is handled. In two of the three specimens before me the spinelets have almost disappeared, leaving a somewhat bare abactinal surface.

The madreporite is very small, almost central in position and porous, not striated or channelled.

The terminal plate is relatively small and usually bare.

The papular pores are numerous, well developed and situated in the notched or crescentic upper surface of the abactinal plates. About twelve series of papular pores occur at the base of each ray. Five to six median series extend from the disc towards the terminal plate, but terminate just before that structure is reached. The centre of the disc, which contains few papular pores, is enclosed by a ring formed by a number of large crescentic plates from which radiate five short and non-perforate inter-radial bands. These bands more or less isolate the pores on the disc and rays so as to create five separate areas.

Twenty-five to twenty-seven superomarginal plates occur on each side of a ray. They are regularly arranged, round, with elevated dome-like centres, a little larger than most abactinal plates in the immediate vicinity, and armed with a circular tuft of delicate spinelets similar in character to those occurring on adjacent abactinal plates. The inferomarginal plates about equal the superomarginals in number. They project outward beyond the superomarginals for some

distance, thus making a small though very distinct marginal flange. The inferomarginal plates are flat and wedge-shaped, and placed obliquely so as to overlap one another. Sometimes a distinct space separates individual plates, but the oblique arrangement in such cases remains unaltered.

Each of the five actinal intermediate areas is made up of from seven to eight chevrons of plates. The first and second (counting from the furrow) reach to the tip of the ray, while the third reaches to about the seventh inferomarginal plate. Each plate carries from three to six fairly long, though very slender spinelets. On each side of the second chevron and between the first and second, or third and fourth plate (counting from the angle of the chevron), there is a small uncalcified area in the form of a brownish membrane similar to ones described in species of the genus *Disasterina* hereinafter dealt with. In all five pairs of uncalcified areas are to be seen on the actinal surface near the oral plates. These areas are small, though distinct, and occur in all three specimens before me. Although the presence of uncalcified areas serves to distinguish species of *Disasterina,* as pointed out elsewhere in this contribution, the present species, apart from having paired areas, is so different in most other characters that it cannot be placed in *Disasterina.*

The adambulacral armature is in two series. The inner, or furrow series, is made up of curved combs containing from four to five fairly long, though very slender, spinelets; they are like those seen in *A. cepheus.* The outer series is very similar in character to the furrow series. It is made up of obliquely-placed combs containing from four to five slender spinelets.

Six marginal spinelets occur on each oral plate. These spinelets, like all others on the actinal surface, are noticeably thin and slender. The innermost marginal spinelet is the longest; the remainder grade away only very gradually. On the actinal surface of each oral plate three to four spinelets, arranged in a slight curve, are to be seen.

Locality.—Tasmania (Austr. Museum Reg. No. J. 1241), holotype, R.=11 mm.

Tasmania (Austr. Museum Reg. No. G. 11522), two paratypes, R.=13 mm.

Affinities.—The above species appears to be closely allied to *A. cepheus* M. and Tr. (=*A. burtonii* Gray). After examination of an extensive series of *cepheus* from such localities as Queensland, Western Australia and New Guinea, and comparing the specimens with *scobinata,* the following characters have been found useful as a means of separation. In *scobinata* the rays are acutely pointed, whereas in *cepheus* they are blunt and rounded. The marginal flange caused by projecting marginal plates in *cepheus* is not nearly so prominent in *scobinata.* The abactinal plates in *scobinata* carry more spinelets than in *cepheus.* The entire actinal spinulation in *scobinata* is much finer than that of *cepheus.* Ten small uncalcified patches, a pair in each actinal intermediate area situated near the mouth, occur in *scobinata* and are wanting in *cepheus.*

Asterina scobinata is also allied to *Asterina batheri* Goto. The characters distinguishing the two species are as follows:—In *scobinata* the marginal plates are small, not larger than adjacent actinal and abactinal plates as seen in *batheri.* The furrow spinlets in *batheri* range from six to seven in number, whereas in *scobinata* only four to five occur. The actinal surface of each oral plate in *scobinata* does not carry so many spinelets as in *batheri.* The uncalcified patches which occur in *scobinata* are absent in *batheri.*

Asterina inopinata sp. nov.

(Pl. v, figs. 1–8 and 14.)

"*Palmipes ?* sp." Whitelegge, Journ. Roy. Soc. N.S. Wales, xxiii, 1889, p. 201.

Description.—Body comparatively thin and depressed, particularly noticeable in juvenile examples of the species. Rays five, stout, and of equal length, depressed abactinally. In holotype R. = 13 mm., r. = 10.5 mm., R. = 1.2 r. Each interbrachial arc is in the form of a shallow concavity.

The abactinal plates are imbricated, less so in the inter-radial regions, the free upper crescentic edges facing the centre of the disc. The abactinal plates are almost wholly bare. They are totally devoid of granules of any kind. A few minute glass-like spinelets sometimes border the free crescentic upper edge of abactinal plates on the disc and radial regions, and an occasional central tuft of from one to four similar spinelets occurs on plates of the inter-radial regions. In some specimens almost every plate in the inter-radial regions carries a tuft of minute spinelets. Stress is laid upon the fact that such spinelets are exceedingly small and almost invisible to the unaided eye.

The largest abactinal plates occur on the disc, where they are arranged in the form of a central ring. Arising from this ring are five inter-radial bands of similar large plates which extend outwards for a short distance.

The papular pores are in the form of pits, which lie within the crescentic sinus on the upper surface of the abactinal plates. The pores are confined to the disc and radial areas. One or two rows of pores extend along each side of the median series of radial plates, to end abruptly some distance short of the terminal plate. The median radial series of plates are partially separated by papular pores for about the first two-thirds of their length; the last third continues on uninterruptedly to reach the terminal plate. The inter-radial areas are devoid of papular pores.

The marginal plates are prominent, particularly the inferomarginal series, where each plate is provided with a circular bunch of small crowded spinelets. These spinelets, being dense and closely packed, are responsible for the formation of a somewhat prominent marginal flange.

The actinal intermediate plates are arranged in nine regular chevrons. Only the series lying next to the adambulacral plates reaches to the tip of the ray. The second series extends to the third inferomarginal plate, the third series reaches to the fourth inferomarginal plate, while the fourth series terminates at the sixth inferomarginal plate. Each actinal intermediate plate carries a curved, or sometimes straight single row of from two to four (mostly two to three) stout and sharply pointed spinelets, which are basally webbed for about half their length. The spinelets are fairly stout and well developed basally, and are firmly attached to the plate. In the holotype the actinal intermediate plates are separated from one another by a thin integument, which, owing to shrinkage when drying, has given the plates a raised appearance.

The furrow spines are long and slender, tapering only very slightly. Each comb contains five to six spinelets arranged in a crescent and webbed for almost their entire length; in some cases only the extreme tips of the furrow spinelets are free of the webbing. The spinelets are spaced evenly apart and are fan-like. The spinelet lying nearest the mouth is always conspicuously shorter than any other spinelet in the comb. Behind the furrow series is a second series of two to three well developed spinelets, webbed for most of their length and arranged in a slight curve. Each comb of this second series of adambulacral spinelets is placed at an angle of about forty-five degrees to the furrow.

The oral plates have a marginal series of eight spinelets, increasing gradually in size to the innermost pair, which are of equal length and the largest of the series. These spinelets are webbed for well over three-quarters of their length. On the actinal face of each oral plate there are three webbed spinelets arranged in a slight curve.

A small madreporite is placed just within the circle of large apical plates on the disk.

No pedicellariæ.

Localities.—Under stones between tide marks, Long Reef, Collaroy, near Sydney, N.S. Wales; Holotype and eleven paratypes (Austr. Museum Reg. No. J. 3077).

Inter-tidal zone two miles south of The Entrance, Tuggerah Lakes, New South Wales, 1924; one specimen, Austr. Museum Reg. No. J. 4406).

Shellharbour, N.S. Wales; two specimens (Austr. Museum Reg. Nos. J. 4501, J. 4552).

Tasmania; one specimen (Austr. Mus. Reg. No. G. 11518).

Watson's Bay, Port Jackson, N.S.W.; thirteen specimens (Austr. Museum Reg. Nos. J. 440, J. 442).

Affinities.—This species is allied to *Palmipes sarasini* de Loriol. Before dealing with the points of difference between the two species it seems necessary to point out that *sarasini* would seem to be better placed in *Asterina* than in *Anseropoda*, the genus now accepted in place of *Palmipes*. *Asterina inopinata* can be distinguished from *sarasini* in that it is devoid of an abactinal granulation, and that it does not possess cylindrical points on plates of the disc.

Two specimens of *Asterina nuda* H. L. Clark, collected at the type locality in 1907, have been examined and compared with specimens of *inopinata*. The following differences have been considered worthy of note:—*A. inopinata* differs from *nuda* in the character of the adambulacral armature, the spinulation of the oral plates, and in the character of the marginal spinulation, which, in *nuda*, does not nearly reach the degree of development and the size characteristic of *inopinata*.

Variation and Remarks.—In the youngest example R. = 3 mm.; that is much the same as adult specimens in the shape of the body. The abactinal plates, however, are not so well imbricated as in adults, and the crescentic upper surfaces are either absent or only very faintly defined. Only a few papular pores occur. Five inter-radial slits completely perforating the body are present. The abactinal plates possess from one to three centrally placed spinelets of very small size. Abactinal plates in the inter-radial areas are more conspicuously armed in this manner than any other plates on the abactinal surface.

Occasionally a plate on the disc bears a curved series of from two to four spinelets on its free upper edge as seen in the adult form. The marginal flange of spines in this and slightly larger juveniles is very prominent, and seems to reach a greater stage of development than in adults. In the smallest juvenile the actinal intermediate plates, which are arranged in three chevrons, are armed with a single central spinelet of comparatively large size, and, as in dried adults, the plates themselves are slightly raised and well defined. The furrow spinelets range from two to four in number, three being usually present. The spinelets of the second or outer series are mostly in pairs. Oral plates possess five or six spinelets as a marginal series. A solitary spinelet occurs on the actinal face of each oral plate.

Except that the actinal plates bear two central spinelets instead of one, and the abactinal plates become a little more imbricated and crescentic, the characters set out as above for the smallest juvenile persist in specimens up to R. = 6.5 mm., or even a little more. In specimens with R. = 7.5 mm. or more, the adult characters as set out in the description of the holotype are to be seen.

The largest specimen, a paratype, has R. = 16.5 mm.; it does not exhibit any variable characters.

THE VALIDITY OF THE SUB-FAMILY TREMASTERINAE SLADEN.

This discussion has been included here owing to the subject matter being closely bound up with the variation shown by juvenile examples of *Asterina inopinata*.

Sladen[1] proposed the sub-family name in 1889, and Fisher[2], with others, accepted it, setting out the characters in key form. The sub-family certainly shows characters which warrant its position in the classification, but in the light of new facts it would seem that its validity is open to question. The fact that *Asterina inopinata* in its juvenile phases can be associated with the sub-family Tremasterinae and with the Asterininae in its adult stages seems sufficient reason for ceasing to recognise the sub-family Tremasterinae. In such an event the genus *Tremaster* could be placed in the sub-family Anseropodinae.

The characters exhibited by juvenile specimen of *Asterina inopinata* which agree with the diagnosis of the sub-family Tremasterinae as set out by Fisher (*loc. cit.*) are as follows. General form of the body like *Anseropoda*. Abactinal plates imbricated, with free margin facing centre of disc. Papulae confined to radial areas, not quite reaching centre of disc. The presence of inter-radial slits completely perforating the body. A series of specimens shows that these slits gradually work out towards the margin and disappear as the adult condition approaches (see Pl. v, figs 1-7).

Disasterina Perrier.

Disasterina Perrier, Rev. Stell. Mus. Hist. Nat. Paris, 1875, p. 289.

Habroporina H. L. Clark, The Echinoderm Fauna of Torres Strait; Dept. Mar. Biol. Carnegie Inst., Washington, x, 1921, p. 34.

A single specimen before me from New Caledonia agrees so well with Perrier's description of *Disasterina abnormalis* that I have no hesitation in associating it with that species, especially as it comes from the type locality. *D. abnormalis* is the genotype, and when the specimen before me is compared with the description and figures of *Habroporina pulchella*, also a genotype, no differentiating characters are to be seen. Therefore, *Habroporina* H. L. Clark must be relegated to the synonymy of *Disasterina* Perrier.

Disasterina abnormalis has not received any material attention since its original description by Perrier, a fact which has, no doubt, been responsible for the misunderstanding of the genus. With nothing beyond Perrier's diagnosis to guide them authors have placed into *Disasterina* species which have no place there, with the result that the characters of the genus have been so widened as to become somewhat misleading. Verrill (1913) furnished an interpretation of the genus, giving characters which have too wide an application, and Döderlein has placed in *Disasterina* a species (*ceylonica*) which, I believe, is not referable to it

[1] Sladen, Zool. Challenger, Asteroidea, xxx, 1889, p. xxxiv.
[2] Fisher, U.S. Nat. Mus., Bull. 76, 1911, p. 254.

Likewise, owing to the confused condition of the genus, Dr. H. L. Clark named a species *leptacantha* which should have been placed in *Disasterina* rather than *Asterina*. The species *spinosa* which Koehler described in 1910 under *Disasterina* should have no place in that genus; its position is doubtful. The species is unique, it cannot be placed with certainty in any existing genus, and the only course at the moment is to leave the question open until more material is examined. On present indications the erection of a new genus for its reception seems necessary.

After studying the characters exhibited by specimens of *Disasterina abnormalis* from New Caledonia, Murray Island, Torres Strait (type locality of *Habroporina pulchella* H.L.C.) and Michaelmas Cay, off Cairns, Queensland, and taking account of other considerations, I have reached the following conclusions and formed the succeeding diagnosis.

That *Disasterina abnormalis* Perrier is valid.

That *Habroporina* H.L.C. should be relegated to the synonymy of *Disasterina* Perrier.

That *Habroporina pulchella* H.L.C. is a synonym of *Disasterina abnormalis* Perrier.

That *Asterina leptacantha* H.L.C. should be placed in *Disasterina*.

That the position of *Disasterina spinosa* Koehler is doubtful; the species is valid.

That *Disasterina ceylonica* Döderlein is referable to the new genus *Tegulaster* described later in this contribution.

Diagnosis.—Form stellate. Rays well differentiated from disc. Abactinal plates not all in regular order; either completely or partially bare. Abactinal plates slightly or strongly imbricated, in all but one species covered by a moderately thick integument capable of obscuring the plates in living or alcoholic specimens. Inferomarginals produced to form a flange and armed with spines varying in number and form.

Papulae noticeably large, scattered at random on disc and radial regions. Spinelets on actinal surface sacculate, one to each actinal intermediate plate. A comparatively large uncalcified patch of membrane in each actinal intermediate area close to mouth. No pedicellariae.

The genus can be distinguished principally by the sacculate nature of the actinal spinulation, the presence of uncalcified patches on the actinal surface, and by the presence of an integument on the abactinal surface.

The species belonging to the genus *Disasterina* are:—*D. abnormalis* Perrier (genotype), *D. leptacantha* (H. L. Clark), and *D. praesignis* sp. nov. (p. 10).

Remarks.—In recognizing this genus attention must be paid to the nature of the actinal surface; the somewhat sacculate nature of the spinulation, the well armed and well produced inferomarginals, and the five uncalcified patches of membrane. All the species which I believe should be grouped together under *Disasterina* are remarkably constant in the character of the actinal surface.

In some instances the degree of imbrication of the abactinal plates is seen to be a character useless for generic differentiation. Its variation in obviously related species leads to confusion when used as a character in grouping. The species regarded herein as belonging to *Disasterina* illustrate the position. In *abnormalis* the imbrication of abactinal plates is slight and barely discernible in dry specimens. In *leptacantha* the degree of imbrication is intensified and more

clearly seen, while in *praesignis* the imbrication reaches a development comparable to a typical *Asterina*. The presence of an integument covering and obscuring the abactinal plates in living specimens, while helpful in recognizing a species in which it has reached a goodly development, is hardly worthy of generic recognition. Like the abactinal plates which it covers it is variable among the species of the genus and entirely absent in *praesignis*.

Disasterina abnormalis (Perrier).

(Pl. iv, figs. 6–7, 9; pl. v, fig. 13.)

Disasterina abnormalis Perrier, Rev. Stell, Mus. Hist. Nat., Paris, 1875, p. 289.

Habroporina pulchella H. L. Clark, The Echinoderm Fauna of Torres Strait; Dept. Marine Biol. Carnegie Inst., Washington, x, 1921, p. 34, pl. iv, fig. 2; pl. xxiv, figs. 2–3; pl. xxvi, figs. 4–5.

The reasons given above for placing *Habroporina* in the synonymy of *Disasterina* are sufficient to explain why *H. pulchella* has been placed in the synonymy of *D. abnormalis*. It may be well to point out, however, that, when describing *H. pulchella*, Dr. Clark made no reference to the presence of five uncalcified patches of membrane on the actinal surface near the mouth. These can be distinguished on pl. xxvi, fig. 5 in Dr. Clark's work (*loc. cit.*).

Description.—Disc and rays only slightly to moderately elevated. Rays five, well differentiated from the disc. In dry specimens R. = 2 to 2.5 r.

Abactinal surface of body covered by a moderately thick integument, which obscures the abactinal plates in living or alcoholic specimens. In dry specimens the integument shrinks and the abactinal plates can be seen. The abactinal plates, at least on the disc and radial areas, are irregularly placed, of varying size and heights, thus giving the general surface an uneven and rugged appearance. They are only very slightly imbricated, sometimes disjointed, leaving small membraneous areas between them. The plates are bare except for minute granule-like bosses which can be seen under a high magnification. Abactinal plates in the inter-radial regions are more or less regularly arranged in rows, smaller and more evenly graded in height than those on the disc and radial regions. In young specimens some inter-radial plates carry a small, single, upright spinelet.

Several large plates on the disc are arranged in the form of a central crown, from which five inter-radial bands of plates arise to proceed towards the margin. These inter-radial bands are conspicuous owing to their large size and also because no popular pores occur to separate and break them up.

The papular pores are isolated, of large size and confined to the disc and radial regions. They are arranged in a more or less serial order. In young specimens four series of pores run from the disc down the top of each ray towards the terminal plate. The inner pair end about half way from the centre of the disc to the terminal plate, while the outer pair continue on for some distance beyond that point. In older specimens six rows or series of papular pores leave the disc to run down the top of each ray towards the terminal plate. The outermost pair ends abruptly shortly after leaving the disc, the innermost pair ends by uniting some distance from the terminal plate, while the intermediate pair proceeds for the greatest distance to end just short of the terminal plate.

The madreporite, which is situated at a point about one-third the distance from the anal aperture to the margin, is embedded in one of the five inter-radial bands of plates described above. Its surface is on a level with the general surface.

The terminal plate is fairly well developed in large specimens and is about one-third the total width of the end of the ray. It is armed with from one to four small sacculate spinelets situated in a transverse row on the distal half.

The superomarginal plates appear to be lost among the plates of the abactinal surface near the margin. They cannot be disassociated or recognized as a definite series.

The inferomarginal series, however, is very prominent. The plates of this series, together with some on the edge of the abactinal surface, are produced to form a conspicuous flange which completely encircles the body. The inferomarginals in juvenile specimens carry three to four webbed and sacculate spinelets. These spinelets are of considerable length, thus making the lateral flange more prominent. In older specimens one to three spinelets, usually two, occur on the outside edge of each inferomarginal. Being long, of a sacculate nature, poorly calcified, and webbed for the greater portion of their length they appear, as Dr. Clark states, like long pedicellariæ.

The actinal surface is invested in a thin transparent membrance, which does not conceal the faintly imbricated nature of the actual intermediate plates. These latter are arranged in regular order, and have been described in detail by Dr. Clark in his description of *Habroporina pulchella.* Many are provided with a single long, sacculate spinelet which is swollen basally. Near the oral plates such spinelets are lacking, their places being occupied by an irregularly shaped uncalcified membrane of fairly large size. In some instances one or two "floating" plates are to be seen in the substance of the membrane.

On the furrow margin of each adambulacral plate is a comb made up of from two to four (usually three or four according to age) long, poorly calcified spinelets united laterally by a thin membrane. Immediately behind, and on the actinal surface of each adambulacral plate, is a single, unusually long sacculate spine with a swollen base. Each adambulacral plate is separated to some extent from its neighbour by a small uncalcified area which is situated at the base of the furrow comb. In young examples four, and in older specimens up to six, webbed marginal spines occur on each oral plate. The innermost is always the longest and the outermost the shortest. On the surface of each oral plate is a long sacculate spine. This is really the last spine of the actinal adambulacral series.

For colour in life see Clark (*loc. cit.*).

Type locality.—New Caledonia (Perrier).

Localities of material examined.—

Noumea, New Caledonia (Austr. Mus. Reg. No. J. 5042) R. = 15 mm.

Murray Island, Torres Strait (Austr. Mus. Reg. No. J. 5619) R. = approx. 10 mm., rays curled).

Michaelmas Cay, off Cairns, Queensland (Austr. Mus. Reg. No. J. 4947) Two specimens, R. = 20 mm., R. = 17 mm.

Disasterina leptacantha (H. L. Clark).

(Pl. iii, figs. 5–6; pl. iv, figs. 1, 4.)

Asterina leptacantha H. L. Clark, Biol. Results F.I.S. "Endeavour," Sydney, iv, pt. 1, 1916, p. 57, pl. xviii, figs. 3–4.

The holotype of this species, which is housed in the Australian Museum, Sydney, has been used, along with several other specimens, in the preparation of

the following description. There can be absolutely no doubt about the close relationship between this species and *abnormalis*, and grouping them under one generic heading is, I believe, most desirable.

Description.—Rays five. R. = 2 to 2.5 r. Disc slightly elevated. The rays are also slightly elevated and each ends in a blunt, somewhat rounded manner. The abactinal plates are not so well imbricated as in species of allied genera and on the whole are more loosely arranged. They are deeply notched on the upper side for the passage of the papulae. In adult examples all abactinal plates are bare except those immediately surrounding the anal pore and madreporite. Plates occupying such a position are armed with numerous, small, needle-like spinelets. In young examples many abactinal plates carry a single, or a row of several, small spinelets. This armed character of the abactinal plates is most noticeable in the inter-radial regions. In young specimens the arrangement of the abactinal plates, particularly on the disc and radial regions, is not regular, but in older examples a somewhat regular, but far from perfect, order exists. In many of the specimens before me some abactinal plates are wholly covered and obscured by a thin integument such as is seen in *abnormalis*. In mature examples ten to twelve irregular series of abactinal plates are to be counted at the base of each ray.

The terminal plate is fairly well developed.

In adults the papular pores are large and conspicuous as seen in *abnormalis*. Five to seven series of pores occur at the base of each ray, but only two or three rows extend beyond half the length of the ray. In young examples the papular pores are not regularly arranged into rows or series.

The superomarginal plates are perfectly bare and very small.

The inferomarginals are very conspicuous and by the aid of their spines form a well defined flange. Each inferomarginal plate in adult examples carries a tuft of delicate needle-like spinelets of considerable length.

These spinelets vary in number but never less than twelve occur on each plate. In young examples the long tuft-like growth of spinelets is absent. Their place is taken by a single row of from four to five short thin spinelets.

Except in the vicinity of the mouth every actinal intermediate plate carries a long, centrally placed, sacculate spinelet exactly similar to those occurring in *abnormalis*. In each actinal intermediate area near the mouth there is a conspicuous patch of uncalcified membrane varying in size within the individual and sometimes bearing a "floating" plate complete with sacculate spinelet.

The adambulacral armature is in two series. The inner or furrow series is made up of combs containing from four to six (usually five, even in small examples) spinelets arranged in a fan-like manner and webbed for nearly their entire length. The outer series is made up of a row of single, long, sacculate spinelets, which are twice as long as those occurring on adjacent actinal intermediate plates. Each adambulacral plate is separated from its neighbour by a small patch of uncalcified integument as seen in *abnormalis*.

The number of spinelets bordering each oral plate ranges from seven to nine. The innermost is the largest and the outermost the smallest. A single, long, sacculate spinelet occurs on the actinal face of each oral plate. When examining the holotype Dr. Clark evidently overlooked several spinelets which are now seen to border the oral plates. This explanation will serve to correct any discrepancy between his published observations and my own.

Type locality.—Masthead Island, Queensland.

Localities of material examined:—

Masthead Island, Capricorn Group, Queensland (Austr. Mus. Reg. No. J. 3082) Holotype, R = 18 mm.

Masthead Island, Capricorn Group, Queensland (Austr. Mus. Reg. No. J. 1697), R. = 11 mm., ray curled.

Norwest Island, Capricorn Group, Queensland (Austr. Mus. Reg. Nos. J. 5506), J. 5179, J. 5604, J. 5600), eight specimens, R. = 12.5 to 18.5 mm.

Heron Island, Capricorn Group, Queensland (Austr. Mus. Reg. No. J. 5172), four specimens, R. = 12 to 24.5 mm.

Remarks.—This species is not very common at any of the above localities. It is usually found under dead coral boulders in pools at low tide.

Disasterina praesignis sp. nov.

(Pl. i, figs. 5, 8; pl. ii, fig. 5.)

Description.—General form of body as in species of *Asterina.* Rays of moderate length, rounded and flattened at their free extremities. R. = 14 mm., r. = 8 mm., R. = 1.7 r. Br. at base of ray 9.5 mm. Disc and rays moderately elevated with a deep suture in each inter-radius. The presence of this latter may be due to the dry condition of the specimen. Abactinal plates strongly imbricated, particularly on the disc and base of rays; nowhere covered by a thickened membrane or integument. The plates are notched on their upper sides for the passage of the papulae. The abactinal plates on the disc are of varying sizes and shapes and not arranged in any definite order. In the inter-radial regions near the interbrachial arcs the abactinal plates are very small and only moderately imbricated. All the abactinal plates are bare and wholly unarmed, except a few surrounding the anal pores and madreporite, which are provided with small granule-like spinlets. The anal pore, which is central in position, is more or less completely surrounded by a ring of very large crescentic plates almost upright in position.

The terminal plate is moderately developed, and occupies about one-third to one-quarter the distance across the tip of the ray.

The papular pores are fairly numerous and on the disc are not regularly arranged. About eight series of papular pores run from the base of each ray towards the tip, but only three or four reach a point beyond half the length of the ray. No papular pores occur between plates near, or at the ends of, the rays.

The superomarginal plates are very large and prominent, not small and hard to detect as in other species of the genus. They are heart-shaped and in size are at least twice as large as adjacent abactinal plates. The superomarginals, together with the inferomarginals and their attached spinelets, form a prominent flange around the body.

The inferomarginal plates are well developed but not as large as the superomarginals. Each inferomarginal plate carries a tuft of from four to six very small and short spinelets which are not webbed.

The actinal intermediate plates are regularly arranged into about nine chevrons. Each plate, except in the vicinity of the oral plates, carries a single, long, sacculate spinelet as in the two other species of the genus.

The adambulacral armature is in two series. The inner or furrow series is made up of combs containing from three to four spinelets, usually four, webbed

for less than half their length. The furrow spinelets, which are placed close together and not arranged fanwise, are relatively long and slender, tapering gradually towards their pointed free extremities. The two inner spinelets of each comb are the longest and are of equal length. The two outermost spinelets are a little shorter yet equal one another in length. The outer adambulacral series is in the form of a single row of spinelets, one spinelet to each adambulacral plate. These spinelets are of a sacculate nature, long, and tapering to a sharp point, very similar to, but twice as long as, spinelets occurring on the actinal intermediate plates. Each adambulacral plate is conspicuously separated actinally from its neighbour by a rectangular patch of uncalcified membrane, which can be seen between the inner and outer series of adambulacral spines. Certain plates near the mouth in each actinal intermediate area are replaced by a patch of uncalcified membrane of irregular shape and comparatively large size. It can be easily seen with the unaided eye as in other members of the genus. One to three actinal intermediate plates appear to be "floating" in the substance of the membrane, and in some instances these plates carry the usual central, sacculate spinelet.

The oral plates are small and carry from eight to nine marginal spinelets, which are webbed for only a small part of their length. The innermost spine, which is the longest, is strong and robust. The remainder fall away very rapidly in length, the last spine being very small and inconspicuous. A single, long, sacculate spine, slightly shorter than the innermost of the marginal series, occurs on the actinal face of each oral plate.

Locality.—North Channel, off Curtis Island, Port Curtis, Queensland. Dredged in three to four fathoms, July, 1929 (Austr. Museum Reg. No. J. 5059). One specimen, the holotype.

Remarks.—This species is undoubtedly related to the two foregoing species of *Disasterina,* and should be placed in that genus for reasons given earlier in this paper. Its main points of difference lie in the general form of the body, the strongly imbricated character of the abactinal plates and the large size of the superomarginal plates. Evidently the species is not an inhabitant of the intertidal zone like the two other members of the genus. The collectors, Messrs. W. Boardman and M. Ward, have informed me that all their dredging operations off Curtis Island were carried out in fairly deep water and over ground that was always covered at low tide. The nature of the bottom tended to muddiness, with patches of dead and living coral.

Tegulaster gen. nov.

Diagnosis.—Rays five, long, each tapering only very slightly to a well rounded tip. Abactinal surface of each ray keeled longitudinally, the sides sloping away very abruptly so as to make the rays acutely triangular in section. Abactinal plates bare and of varying sizes; imbricated, not all arranged in regular order.

Actinal intermediate plates small, armed with from one to four webbed spinelets arranged in a straight line. Furrow spines five to six. Oral plates small. Pedicellariae present.

Genotype.—Tegulaster emburyi sp. nov.

Remarks.—Döderlein's *Disasterina ceylonica* and *Tegulaster emburyi* sp. nov., which is fully described in the following pages, are so closely related and so different from *Disasterina* as intended by Perrier that it seems most desirable to have them associated under one heading. Hence the reason for the creation of

the genus *Tegulaster*. Despite the fact that the Sub-family *Asterininae* contains many genera of uncertain value, which, to-day are in some confusion, I venture to adopt this course. Neither of the two above species can be placed in any existing genus, not even if the diagnoses are accepted in their broadest terms.

The genus *Tegulaster* can be distinguished from other genera within the sub-family Asterininae by its long, gradually tapering rays, the conspicuous keeled nature of the mid-radial plates of the rays and the abrupt falling away of the sides of the rays.

Tegulaster emburyi sp. nov. [3]

(Pl. i, figs. 1, 3; pl. ii, figs. 2–3, 6 and 9.)

Description.—Rays five, R. = 19 mm., r. = 7.5 mm., Br. (at base of ray) 8.5 mm. R. = 2.5 r. and 2.2 br. The rays are sharply separated from the disc, each is strongly keeled longitudinally on the abactinal surface, the sides sloping away very abruptly to give the rays an acutely triangular appearance in section.

The interbrachial arcs are very acute.

The abactinal plates are, for the most part, in regular order, but near the ends of the rays they become irregular and uneven. All are imbricated, those in the median radial areas more strongly so than anywhere else. In addition, the abactinal plates in the median radial areas are considerably larger than any other plates on the abactinal surface. The abactinal plates are bare except for pedicellariae and a few small, centrally placed spinelets on the disc and plates near the margins. Under a good magnification the abactinal plates are seen to be somewhat rugged and covered by a glistening, transparent membrane. The centre of the disc is strongly marked off by a circle of five, large, crescentic plates, which are actually the first plates of the median radial series.

The plates within the enclosed area are much smaller than most plates of the abactinal surface. They are circular in shape, irregularly arranged, of a uniform size, and only very slightly imbricated.

The small madreporite is interradial in position, porous and not striated, slightly sunken below the level of the general surface, and roundly triangular in shape. The two upper angles of this triangular madreporite rest next to the primary plates of two of the median radial series.

The terminal plate is about twice the size of abactinal plates situated nearby. It is bare and rugged in appearance.

The papular pores are not always arranged in regular order. On the middle of the disc, within the circular area formed by the large crescentic primary plates of the median radial series, the pores are scattered and number about fifteen. Seven to eight series, sometimes broken, leave the disc to proceed down each ray. The four innermost series, although broken here and there as the median radial plates become irregularly arranged, reach almost to the terminal plate and are separated from that structure by about three small abactinal plates. The remaining series end at a point a little beyond half the length of the ray, or less as is often seen. One to three papular pores occur at random between interradial plates but never close to the margin. The abactinal plates are only very slightly notched or sinuated for the passage of the papulae.

Pedicellariae are fairly abundant but occur only on the abactinal surface. They are two-bladed, erect and forciform. Almost invariably each occupies a

[3] Named for Mr. E. M. Embury, of Manilla, New South Wales, who was responsible for the expedition on which this species was collected.

place on the slightly notched upper surface of abactinal plates. Their close proximity to the papular pores indicates that they probably afford protection to the delicate papulae.

The superomarginals average thirty in number, are clearly defined, small, and circular. They are slightly domed and elevated somewhat beyond the level of the slightly larger abactinal plates nearby.

The inferomarginals also average about thirty in number. They project outward for some little distance beyond the superomarginals and are armed with a row of from three to six very short spinelets.

The actinal intermediate plates are arranged in six chevrons. Counting from the furrow the first series reaches to the tip of the ray. The second series, if uninterrupted by the third, also reaches to the tip of the ray. The third series sometimes reaches to the end of the ray at the expense of the second series. The fourth series terminates at a point a little beyond half the length of the ray while the remaining series proceed for only short distances along the ray. Each actinal intermediate plate carries a straight, centrally placed series of from one to four, usually two, spinelets which are webbed for about half their length. Single spines occur on plates situated near the margin.

The adambulacral armature is in two series. The inner, or furrow series, is made up of combs containing six to seven, usually six, spines arranged fanwise and webbed for nearly their entire length. The outer series, which is situated on the actinal surface, is made up of from two to four spinelets a little longer than those occurring on the actinal intermediate plates. In the distal half of the ray usually only two spinelets occur, but close to the mouth three predominate along with an occasional group of four. When three occur the central spinelet is, in most cases, the longest. When four occur the central pair are the longest.

The oral plates are comparatively small and inconspicuous. Eight to nine marginal spines occur on each oral plate. The innermost pair are very long; the innermost spine is the longest. A pair of long and unusually stout spines are placed well forward on the actinal surface of each oral plate. These are backed by four smaller spines arranged in a row.

Colour in Life.—The life colours of this species are very gaudy. The circular area on the middle of the disc is coloured a bright orange. Some plates in the inter-radial region are similarly coloured. The remainder of the abactinal surface is of a deep cream colour blotched irregularly here and there with large patches of both light and deep magenta. The actinal surface is creamish, with a few small and well-spaced patches of deep magenta.

Although the specimen was placed directly into an alcohol preservative when collected the colours faded only very slightly. Even when dried the specimen retained its brilliant colouration more or less completely. It appears to be obvious that, in this species, the plates themselves are not coloured. They are stained by a supply of pigment which oozes through certain papular pores and spreads over the creamish plates in the immediate vicinity. This process was witnessed as the specimen was drying after a brief sojourn in alcohol.

Locality.—Norwest Island, Capricorn Group, Queensland. Mr. F. A. McNeill who collected the specimen in January, 1932, informs me that the species was found living under a dead coral boulder near the north-eastern reef crest. (Aust. Mus. Regd. No. J. 5605). Holotype.

Affinities.—This species can be separated from *T. ceylonica* (Döderlein) by the slightly more regular arrangement of the abactinal plates, the greater number of spinelets in both series of the adambulacral armature, and by the fact that the actinal plates as a whole, carry more spinelets.

Asterinopsis praetermissa sp. nov.

(Pl. iii, figs. 1–2, pl. iv, figs. 2–3.)

Asterina penicillata (spelling of specific name obviously intended to be *penicillaris,* as it appears in Müller and Troschel's work quoted by Whitelegge), Whitelegge (*non* Lamarck), "Invertebrate Fauna of Port Jackson. . . ." Journ. Roy. Soc. N.S.W., xxiii, 1889, p. 40, species no. 62.

Description.—Rays five. In the holotype R. = 36 mm., r. = 21 mm., R = 1.7 r. In other specimens R. = 1.4 r. consistently. The disc and rays are only slightly elevated. The interbrachial arcs are wide and well rounded, not acute as in *A. penicillaris* (Lamarck). The abactinal plates are very small and of two types. Those arranged in a somewhat distinct median radial or carinal band on each ray smallest, round, irregularly disposed and not imbricated; those on sides of rays and in the inter-radial regions slightly larger, somewhat ovate, regularly arranged in longitudinal series (except near the margins), and slightly imbricated. Every abactinal plate is provided with a dome-like eminence or boss from which arises a thick, circular bunch of very fine and delicate spinelets, resembling the setae of certain Polychaet worms. These spines give the surface a peculiar furry appearance. The number of spinelets to each boss varies. On the disc and median radial bands the spinelets range from twenty to forty in number; on the sides of the rays and in the inter-radial regions about twelve to twenty-five are to be seen. In specimens smaller than the holotype the number of spines to each boss is relatively smaller. The abactinal plates are not wholly obscured by these spinelets. Everywhere on the abactinal surface bare patches of plates can be seen between the circular clumps of spines, particularly on the sides of the rays.

The papular pores are fairly numerous and occur singly only on the disc and radial areas. Varying according to the size of the specimen, eight to ten series leave the disc to travel down the rays. The inner six series reach almost to the terminal plate, the remainder end at distances usually less than half the length of the ray. Sometimes, however, one of the outer series may proceed for a short distance beyond half the length of the ray.

The terminal plate is comparatively small and is always covered by a number of small, short spinelets.

The madreporite, which is very small, is situated near the centre of the disc. It is circular and channelled.

The marginal plates are small, yet rendered prominent by their very regular arrangement. The superomarginals in the holotype number about one hundred in the interbrachial arc from terminal plate to terminal plate. They are circular in outline and slightly domed. Each is provided with a small tuft of spinelets similar in character to those found on adjacent abactinal plates. The inferomarginal series approach the superomarginals in number. They project slightly beyond the superomarginals and carry the usual tufts of spinelets. The actinal plates are wholly obscured by a covering membrane, but their whereabouts and arrangement can be gauged by the large circular tufts of slender and delicate spinelets which spring from them. All actinal plates, except those very near the margin, are regularly arranged. The series run outward from the furrow towards the margin, about eighty to ninety series occurring in each actinal intermediate area. Each actinal intermediate plate is armed with a circular tuft of about twenty-five spinelets, which are long and slender and decrease in size, height, and numbers as the margin is approached. These tufts are much more widely spaced than those on the abactinal plates so that the membrane covering the actinal plates is clearly seen.

The adambulacral armature is in two series. The inner or furrow series is made up of combs containing from seven to eight, usually eight, long, faintly tapering spinelets, almost of equal length and webbed for over half their length. The second or outer series, which is situated on the actinal surface, is made up of obliquely placed tufts of spinelets. About twenty-five spinelets, which are longer than similar spinelets occurring on nearby actinal intermediate plates, occur in a tuft.

The oral plates carry ten marginal spines. On the actinal surface of each plate a bunch of large spinelets, similar to those on actinal intermediate plates, are to be seen. Behind, and also on the actinal face of the plate, is a second but much smaller bunch of spinelets.

Localities and material examined.—

Little Bay, south of Port Jackson, N.S. Wales; under stones in pools between tide marks (Austr. Mus. Reg. No. J. 4793). Holotype, R. = 36 mm.

Port Jackson, N.S.W. (Austr. Mus. Reg. No. J 1913), one specimen, R. = 18.5 mm.

Port Jackson, N.S.W. (Austr. Mus. Reg. No. J. 1911), one specimen, R. = 29.5 mm.

Port Jackson, N.S.W. (Austr. Mus. Reg. No. J. 3196), two specimens, R. = 19 mm. and 13 mm.

Port Jackson, N.S.W. (Austr. Mus. Reg. No. G. 7644), one specimen, R. = 25 mm.

Remarks.—This is the species referred to by Whitelegge (*loc. cit.*) when he recorded the occurrence of *penicillaris* from Port Jackson, N.S. Wales. *Asterinopsis penicillaris* (Lamarck), I believe, does not occur in Australian waters; likewise I am of the opinion that, when the existing records of the species are checked some will be found to be based on other species. Goto (1914) has already denied its existence in Japanese waters and Clark (1923), throws doubt on the Red Sea records. The meagre description of *penicillaris* in the first place, and the naturally erroneous impressions gained from it later, have largely contributed to the confusion. So far as can be learned no author has given a satisfactory description and figures of the species from which its true characteristics can be gained. Until this is done the species seems destined to be confused with allied species. However, sufficient information can be gained from the old descriptions to convince one that *praetermissa* is distinct.

Asterinopsis praetermissa can be distinguished from *A. penicillaris* principally by its relatively shorter rays, its wide interbrachial arcs and the greater number of furrow spines.

Asterinopsis grandis (H. L. Clark).

(Pl. iii, figs. 3–4, pl. iv, figs. 5, 8.)

Nepanthia grandis H. L. Clark, Rec. South Austr. Museum, iii, No. 4, 1928, p. 393, and figs. 113 a–d in the text.

Asterina sp. Whitelegge, "Invertebrate Fauna of Port Jackson . . . "; Journ. Roy. Soc. N.S.W., 1889, No. 63 on p. 40.

The specimens before me have been compared with the holotype and other specimens examined by Dr. H. L. Clark kindly sent to me on loan by the authorities of the South Australian Museum. The comparison has proved beyond doubt that the Australian Museum specimens are referable to *grandis*.

Whitelegge's "*Asterina* sp." is undoubtedly a synonym of *A. grandis*. That author furnishes a clue to the identity of the species he intended by stating "Allied to the last [*A. penicillaris*—printed as *penicillata* in his work and described in this contribution as a new species, *Asterinopsis praetermissa*] but distinct from it."

The placing of *grandis* in the genus *Asterinopsis* calls for some explanation. In the first place it is considered that *Nepanthia*, as at present understood, is sufficiently distinct to be disregarded in the question. In adopting this belief I have not lost sight of Dr. Clark's able and valued comments (*loc. cit.*), or the fact that *grandis* is not entirely destitute of some slight claim to a position in *Nepanthia*, but in general form of the disc and rays *grandis* is so unlike species of *Nepanthia* that I cannot at present admit the association. Further, although Dr. Clark claims that the skeleton of *grandis* resembles that of a *Nepanthia*, I find that in all but old and fully mature examples no such resemblance can be seen.

The species *grandis* approaches much closer to *Paranepanthia* Fisher than to *Nepanthia*, and, were it not for the fact that *Paranepanthia* is of doubtful value as a genus, being probably a synonym of *Asterinopsis*, I would have no hesitation in referring *grandis* to it. If *Paranepanthia* is to be retained it will be necessary to find some means of disassociating it more clearly from *Asterinopsis*. Fisher[4] admits that "The gap between *Asterinopsis* and *Paranepanthia* is not great."

Localities and material examined.—Apart from the material obtained on loan from the South Australian Museum the following material has been examined:—

Simpson's Bay, d'Entrecasteaux Channel, Tasmania, dredged (Austr. Mus. Reg. No. J. 5009), five specimens, R. = 31 to 50 mm.

Neilsen Park, Port Jackson, N.S.W., under stones between tide marks (Austr. Mus. Reg. No. J. 4630), one specimen, R. = 40 mm.

Port Jackson, N.S.W. (Austr. Mus. Reg. No. J. 1901), one specimen, R. = 28 mm.

Shellharbour, N.S.W. (Austr. Mus. Reg. No. J. 4939), one specimen, R. = 13 mm.

Watson's Bay, Port Jackson, N.S.W. (Austr. Mus. Reg. Nos. J. 441 and J. 443), two specimens, R. = 11.5 mm. and R. = 12.5 mm.

Patiriella mimica sp. nov.

(Pl. i, figs. 6–7; pl. ii, figs. 8, 10–11.)

Description.—Body large and robust as in *calcar*; disc elevated and domelike. Rays five; R. = 24 mm., r. = 14 mm., R. = 1.7 r. Interbrachial arcs well rounded, not relatively acute as in *calcar*.

The abactinal plates are distinct, crescentic, well imbricated except near the margins. They carry, along with the secondary abactinal ossicles, a coarse granulation which does not extend down the sloping sides of the plates being confined mostly to the elevated portions. The granulation, although coarse, is noticeably finer than that covering the abactinal plates of *calcar*. The largest abactinal plates are strongly crescentic and occur on the disc where some are arranged to form an irregular circle enclosing an area containing small, circular and well granulated ossicles.

[4] Fisher, U.S. Nat. Museum Bull. 100, vol. 3, 1919, p. 419.

The papular pores are fairly numerous and lie in groups of from one to four in the crescentic upper surface of the abactinal plates. They are not conspicuous. Radially, the papular pores reach to the terminal plate, while inter-radially they reach to a point about half way from the centre of the disc to the margin.

The superomarginal plates are small and armed with from two to four small spine-like granules. The inferomarginal plates are larger than the superomarginals and project outward some distance to form a small flange. They are unarmed and rounded at their free extremities.

The actinal intermediate plates are arranged into nine to eleven chevrons. They are raised centrally and slightly imbricated. On each raised central portion there is a single, short, conical spine, which, when near the margin, is small, and when near the mouth, larger and better developed. Sometimes two spines, arranged fork-like, occur on plates near the margin.

The adambulacral armature is in two series. The furrow series is composed of paired spines, the innermost of each pair being usually about half to two-thirds the length of its neighbour.

The second or outer series are arranged singly and in line with the furrow. These spines are comparatively long, stout, and bluntly pointed.

The oral plates carry five marginal spines. The two innermost are much longer and thicker than the remaining three. All marginal spines are comparatively short, stout, and bluntly pointed, not long and slender as in *calcar*. A fairly large spine is situated on the actinal face of each oral plate.

Locality.—Newcastle Bight, New South Wales, sixteen to nineteen fathoms (Austr. Museum Reg. No. J. 1696), one specimen, the holotype.

Affinities and Remarks.—*Patiriella mimica* is closely allied to the common intertidal New South Wales species, *P. calcar* (Lamarck), and the specific name *mimica* has been chosen to indicate this fact. Apart from the number of rays, a close examination is necessary before the distinguishing features are fully revealed. *P. mimica* can be separated from *P. calcar* in having five rays instead of from seven to eight (usually eight); in having a finer and denser granulation on plates of the abactinal surface; in having broader rays, and by the fact that the marginal spines of the oral plates are numerically greater, relatively shorter and more dwarfed.

Patiriella inornata sp. nov.

(Pl. i, figs. 2, 4; pl. ii, figs. 1, 4, 7.

Description.—Rays five; R. = 27 mm., r. = 15 mm., R. = 1.8 r. The body is moderately elevated. The abactinal plates are, for the most part, only very slightly imbricated. Those on the disc are not regularly arranged and show very little sign of being imbricated at all, while those on the tops of the rays are crescentic, more or less regularly arranged, and show clearly their imbricated character. The abactinal plates in the interradial areas are almost round in outline, small, and slightly imbricated. All the abactinal plates are covered by coarse and comparatively widely spaced granules.

The superomarginal plates are roundly rectangular in shape, bare, and although not conspicuous, are almost twice the size of abactinal plates nearby. About forty-five superomarginal plates occur on the side of a ray. The inferomarginal plates project for a short distance outwards beyond the superomarginals. They are bare and less than half the size of the superomarginals.

The papular pores are fairly small and numerous. They occur at random on the disc, and, radially, are arranged into twelve or more somewhat irregular series, about six of which reach to the tip of the ray.

The madreporite is almost central in position. It is finely and intricately channelled and unusually large, being four mm. across its widest part. The terminal plate is small, bare, and inconspicuous.

The actinal intermediate plates are not distinguishable, but their positions are indicated by the spinelets springing from them; they are arranged in from nine to eleven chevrons. Near the mouth the actinal intermediate plates are large, the spinelets springing from them being widely spaced; towards the margins the plates become suddenly smaller and crowded. Each actinal intermediate plate is armed with from one to three (usually one) short conical spinelets. Near the margin the spinelets are single and placed closer together. From two to four series of plates reach to the tip of the ray.

The adambulacral armature is in two series. The furrow series is composed of combs containing two to three very short spinelets of varying lengths. In the case of combs made up of three spinelets the centre one is usually the longest. Stress is laid upon the very short and inconspicuous nature of the furrow series. The outer series is made up of spinelets arranged in groups of from one to three. Sometimes the groups are obliquely placed, but usually they are arranged so as to be parallel to the furrow. Single spines occur mostly near the tips of the rays.

The oral plates, which are of moderate size, are provided with four marginal spines. The innermost is the longest. It is flat, slightly hollowed or channelled longitudinally, and sinuated at its free extremity so as to make it appear forked. Each oral plate carries on its actinal face from two to four spines arranged in a line parallel to the furrow.

Locality.—Western Australia (Austr. Mus. Reg. No. J. 3198), one specimen, the holotype.

Affinities.—This species can be easily separated from its nearest allies, *P. calcar* and *P. mimica*, principally by the lack of an abactinal surface made up of well imbricated and conspicuously crescentic plates; by the character of the adambulacral armature and the unusual nature of the innermost marginal spines of the oral plates

EXPLANATION OF PLATES.

Plate I.

Fig. 1.—*Tegulaster emburyi* gen. et. sp. nov. Actinal surface of holotype (Austr. Mus. Reg. No. J. 5605). x 1.5.

Fig. 2.—*Patiriella inornata* sp. nov. Abactinal surface of holotype (Austr. Mus. Reg. No. J. 3198). Slightly over nat. size.

Fig. 3.—*Tegulaster emburyi* gen. et. sp. nov. Abactinal surface of holotype (Austr. Mus. Reg. No. J. 5605). x 1.5.

Fig. 4.—*Patiriella inornata* sp. nov. Actinal surface of holotype (Austr. Mus. Reg. No. J. 3198). x 1.5.

Fig. 5.—*Disasterina praesignis* sp. nov. Actinal surface of holotype (Austr. Mus. Reg. No. J. 5059). x 1.75.

Fig. 6.—*Patiriella mimica* sp. nov. Actinal surface of holotype (Austr. Mus. Reg. No. J. 1696). x. 1.5.

Fig. 7.—*Patiriella mimica* sp. nov. Abactinal surface of holotype (Austr. Mus. Reg. No. J. 1696). x 1.5.

Fig. 8.—*Disasterina praesignis* sp. nov. Abactinal surface of hototype (Austr. Mus. Reg. No. J. 5059). x 1.75.

Plate II.

Fig. 1.—*Patiriella inornata* sp. nov. Enlarged view of oral plates and associated marginal spines in the holotype (Austr. Mus. Reg. No. J. 3198). x 4.

Fig. 2.—*Tegulaster emburyi* gen. et. sp. nov. Enlarged view of portion of ray of holotype showing the slight granulation of the plates, the spinulation of the inferomarginal plates, and the unarmed character of the superomarginals (Austr. Mus. Reg. No. J. 5605). x 6.

Fig. 3.—*Tegulaster emburyi* gen. et. sp. nov. Oral plates and associated spinelets in holotype (Austr. Mus. Reg. No. J. 5605). x 5.

Fig. 4.—*Patiriella inornata* sp. nov. Enlarged view of portion of abactinal surface of holotype (Austr. Mus. Reg. No. J. 3198). x 4.

Fig. 5.—*Disasterina praesignis* sp. nov. Enlarged portion of actinal surface of holotype showing oral plates, actinal intermediate plates with sacculate spinelets, and the uncalcified membrane with unarmed plates "floating" in its substance (Austr. Mus. Reg. No. J. 5059). Approx. x 5.

Fig. 6.—*Tegulaster emburyi* sp. nov. Portion of abactinal interradial area showing imbricated plates and pedicellariae in the holotype (Austr. Mus. Reg. No. J. 5605). Approx. x 8.

Fig. 7.—*Patiriella inornata* sp. nov. Portion of adambulacral armature and actinal plates nearby in holotype (Austr. Mus. Reg. No. J. 3198). Approx. x 4.

Fig. 8.—*Patiriella mimica* sp. nov. Oral plates and associated spinelets in the holotype (Austr. Mus. Reg. No. J. 1696). x 4.

Fig. 9.—*Tegulaster emburyi* gen. et. sp. nov. Adambulacral armature of holotype (Austr. Mus. Reg. No. J. 5605). Approx. 6.

Fig. 10.—*Patiriella mimica* sp. nov. Adambulacral armature of holotype (Austr. Mus. Reg. No. J. 1696). Approx. x 6.

Fig. 11.—*Patiriella mimica* sp. nov. Portion of abactinal surface of holotype (Austr. Mus. Reg. No. J. 1696). x 8.

Plate III.

Fig. 1.—*Asterinopsis praetermissa* sp. nov. Abactinal surface of holotype (Austr. Mus. Reg. No. J. 4793). Nat. size.

Fig. 2.—*Asterinopsis praetermissa* sp. nov. Actinal surface of same specimen as Fig. 1. Nat. size.

Fig. 3.—*Asterinopsis grandis* (H. L. Clark). Abactinal surface of specimen from Port Jackson, N.S.W. (Austr. Mus. Reg. No. J. 1901). Slightly over nat. size.

Fig. 4.—*Asterinopsis grandis* (H. L. Clark). Actinal surface of same specimen as Fig. 3. Slightly over nat. size.

Fig. 5.—*Disasterina leptacantha* (H. L. Clark). Abactinal surface of specimen from Heron Island, Capricorn Group, Queensland (Austr. Mus. Reg. No. J. 5172, part). x 1.5.

Fig. 6.—*Disasterina leptacantha* (H. L. Clark). Actinal surface of same specimen as Fig. 5. x 1.5.

Plate IV.

Fig. 1.—*Disasterina leptacantha* (H. L. Clark). Enlarged portion of side of ray showing the well-developed marginal spinulation and the character of the abactinal plates (Austr. Mus. Reg. No. J. 5172, part). x 7.

Fig. 2.—*Asterinopsis praetermissa* sp. nov. Enlarged section of actinal surface showing character of the oral plates and adambulacral armature (Austr. Mus. Reg. No. J. 4793). Holotype. x 4.

Fig. 3.—*Asterinopsis praetermissa* sp. nov. Enlarged portion of actinal intermediate area showing character of spinulation on the plates. Same specimen as Fig. 2. Approx. x 6.

Fig. 4.—*Disasterina leptacantha* (H. L. Clark). Spinulation of oral plates and character of adambulacral armature. The non-calcified patches are situated immediately behind the oral plates. The lower patch carries a "floating" plate. Same specimen as Fig. 1. x 5.

Fig. 5.—*Asterinopsis grandis* (H. L. Clark). Oral plates and associated spinulation (Austr. Mus. Reg. No. J. 1901). x 5.

Fig. 6.—*Disasterina abnormalis* Perrier. Actinal surface of specimen from New Caledonia (Austr. Mus. Reg. No. J. 5042). x 1.5.

Fig. 7.—*Disasterina abnormalis* Perrier. Abactinal surface of same specimen as Fig. 6. x 1.5.

Fig. 8.—*Asterinopsis grandis* (H. L. Clark). Spinulation of actinal intermediate plates and adambulacral plates. Same specimen as Fig. 5. Approx. x 6.

Fig. 9.—*Disasterina abnormalis* Perrier. Abactinal surface of adult specimen from Michaelmas Cay, off Cairns, Queensland (Austr. Mus. Reg. No. J. 4947, part). x 1.5.

PLATE V.

Figs. 1-5.—*Asterina inopinata* sp. nov. Juvenile examples showing the gradual movement of the interradial slits towards the margins where they disappear as growth proceeds. The marginal flange of spinelets is seen to be very highly developed in juvenile examples (Austr. Mus. Reg. No. J. 440, part). x 3.5.

Fig. 6.—*Asterina inopinata* sp. nov. Actinal surface of holotype (Austr. Mus. Reg. No. J. 3077, part). Slightly under x 2.

Fig. 7.—*Asterina inopinata* sp. nov. Abactinal surface of same specimen as Fig. 6. Slightly under x 2.

Fig. 8.—*Asterina inopinata* sp. nov. Adambulacral armature of same specimen as Fig. 6. Approx. x 6.

Fig. 9.—*Asterina scobinata* sp. nov. Actinal view of holotype (Austr. Mus. Reg. No. J. 1241). x 1.75.

Fig. 10.—*Asterina scobinata* sp. nov. Abactinal surface of same specimen as Fig. 9. x 1.75.

Fig. 11.—*Asterina scobinata* sp. nov. Oral plates of same specimen as Fig. 9. Approx. x 6.

Fig. 12.—*Asterina scobinata* sp. nov. Enlarged section of abactinal surface showing plates and spinelets. Same specimen as Fig. 9. Approx. x 6.

Fig. 13.—*Disasterina abnormalis* Perrier. Oral plates with spinulation and adambulacral armature. The non-calcified areas occur immediately behind the oral plates. The lowermost carries a "floating" plate (Austr. Mus. Reg. No. J. 5042). x 4.

Fig. 14.—*Asterina inopinata* sp. nov. Oral plates and associated spinulation. Same specimen as Fig. 6. x 8.

Fig. 15.—*Asterina scobinata* sp. nov. Adambulacral armature of same specimen as Fig. 9. Approx. x 6.

A NEW *MEDIASTER* FROM QUEENSLAND.

By

ARTHUR A. LIVINGSTONE.

(Assistant Zoologist, the Australian Museum, Sydney.)

(Plate vi.)

The genus *Mediaster* was first recorded from Australian waters by Dr. H. L. Clark[1] when the species *australiensis* and *monacanthus* were described. Fisher[2] believes *monacanthus* to be referable to the genus *Nectria*. No other species of *Mediaster* has been recorded from Australia since 1916.

Mediaster praestans sp. nov.

Description.—Rays five; R. = 29.5 mm., r. = 11.5 mm. R. = 2.5 r. Disc comparatively small, depressed interradially and slightly raised radially. Rays regular, comparatively narrow at base, each tapering rapidly towards a small rounded extremity. Interbrachial arcs fairly narrow and rounded. Abactinal paxillae on plates of disc, the first half of the median radial series, and on the three series lying on either side of this latter widely spaced. Those paxillae placed interradially are crowded, squarish in outline, and separated by shallow channels. The plates near the ends of the rays are not tabulate but simply covered by a coarse granulation. The paxillae on the centre of the disc and radial regions are the largest on the abactinal surface. Each paxilla is stellate; two to six nodular granules form a central group on the upper surface, while from six to seventeen slightly flattened granules form a peripheral series. Interradially, the paxillae are crowded; no peripheral series of granules is present, the granulation being more or less even and uniform, and merging into that covering the superomarginal plates. The median radial plates, which lose their specialized tabulate character before half the length of the ray is reached, terminate at the fourth last superomarginal plate. The series lying next to the median radials end at a point between the ninth and tenth last superomarginals.

The papulae are confined to the disc and radial regions where the paxillae are widely spaced. They occur in sixes around each plate and lie between the internal connecting ossicles. These ossicles are short and very regular; six radiate outwards from each plate, each ossicle being common to two plates. No ossicles occur in the inter-radial areas where papulae are absent.

The superomarginal plates are fifteen in number counting from the middle of the interbrachial arc to the terminal plate. They are noticeably wider than high on the rays, almost wafer-like, while in the interbrachial arcs they are almost as high as broad. This is the reverse of what is seen in *M. ornatus* Fisher. The superomarginals are fairly conspicuous and encroach somewhat noticeably upon the paxillar area. They are covered by small, well-spaced roundish granules of varying sizes. These granules, when rubbed off, leave stout bases in the form of shiny, glass-like bosses.

The inferomarginal plates are also fifteen in number, and correspond both in size and position to the superomarginals. They are covered by a granulation similar in character to that on the superomarginals. The terminal plate is not prominent; it is similar in character to the superomarginals.

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[1] Clark.—Biol. Results, F.I.S. "Endeavour," 4, i, 1916, pp. 39-43, figs. 1-4.
[2] Fisher.—Ann. Mag. Nat. Hist. (8), xx, 1917, p. 167.

The adambulacral plates are squarish in outline and run uninterruptedly to the terminal plate. The furrow spines are in the form of combs, each comb being made up of seven fairly long, delicate, untapered, laterally compressed spinelets. The tips of the spinelets in each comb conform to a slightly curved line. On the actinal face of each adambulacral plate, and immediately behind the furrow series, a second row of four spines occurs. These are short, flat-sided, and stout, the central spine, or central pair, being noticeably larger than the remainder. Behind the second series is a third, made up of a single row of four granules which resemble the general granulation of the actinal surface.

The actinal intermediate plates are paved with well-defined, flat, polygonal plates, which run in regular series parallel to the furrow. The series lying next to the adambulacral plates reaches to the third inferomarginal (counting from the centre of the interbrachial arc). The actinal intermediate plates are provided with about twenty widely and evenly spaced thimble-shaped granules.

The oral plates are of moderate size without a clearly defined median suture. The marginal spines are from eight to nine in number, conspicuously flattened, the innermost spine being very large and prominent. Behind the marginal spines and on the actinal face of each oral plate, there are four spines arranged in a row. These spines are fairly long and only slightly flattened, being more rounded than the marginal spines. The remainder of the actinal face of each oral plate is occupied by a granulation similar to that covering the actinal intermediate plates.

The madreporite is small and circular, raised dome-like above the surrounding paxillae, and situated at a point about one-third the distance from the centre of the disc to the marginal plates. Centrally the madreporite is perforated by a few minute pores, while the sides are deeply channelled by coarse, wavy striations.

Locality.—Great Barrier Reef off Cairns, Queensland; dredged (Australian Museum Reg. No. J. 5618). Holotype.

Remarks.—*Mediaster praestans* is closely allied to *Mediaster ornatus* Fisher. The two species can be separated upon the following characters.

In *M. ornatus* the abactinal plates situated mid-way from centre of disc to terminal plate are arranged in seven radial series, whereas in *M. praestans* only three series of radial plates occur at that point. In *M. praestans* the median radial series of plates do not reach to the terminal plate. In the same species the rays are more acute and the marginal plates more prominent than in *M. ornatus*. Pedicellariae are entirely absent in *M. praestans*. In the same species fifteen superomarginal plates occur on each side of each ray, whereas in *ornatus* twenty-three are found. In *M. praestans* the inferomarginals are opposite the superomarginals which is not the case in *M. ornatus*. In *M. praestans* the actinal intermediate plates terminate at the third inferomarginal, whereas in *M. ornatus* they extend to the fifteenth inferomarginal plate. The oral plates also offer distinguishing characters.

EXPLANATION TO PLATE VI.

Fig. 1.—***Mediaster praestans*** **sp. nov. Enlarged portion of abactinal surface of ray with the granules removed to show the glass-like bosses beneath. The radial plates and the points where the various series end is also shown. x 5.**

Fig. 2.—***Mediaster praestans.*** **Abactinal surface of holotype. x 1.5.**

Fig. 3.—***Mediaster praestans.*** **Actinal surface of holotype. Approx. 1.5.**

Fig. 4.—***Mediaster praestans.*** **Portion of radial area with some paxillae removed to show the underlying plates and the connect-ossicles. The papulae are seen to be arranged in sixes around each plate. x 9.**

Fig. 5.—***Mediaster praestans.*** **Oral plates and associated spinulation. x 9.**

Fig. 6.—***Mediaster praestans.*** **Adambalacral armature. Approx. x 9.**

ETHNOLOGICAL NOTES, No. 5.

By the late

W. W. THORPE,

(Ethnologist, Australian Museum)

and

FREDERICK D. McCARTHY,

(Assistant Ethnologist, Australian Museum).

(Plates vii-ix.)

This paper was commenced by the late W. W. Thorpe shortly before his untimely death. It contains a description of two unusual types of ground stone implements of the Australian aborigines, in the collection of the Australian Museum, and also in the possession of members of the Anthropological Society of New South Wales, to whom thanks are due for the loan of the specimens. The petrological determinations by Mr. T. Hodge-Smith, Mineralogist, Australian Museum, are based on megascopic characters only.

Ground-edge Knives.

(Pls. vii–viii.)

The series figured is extremely interesting, as these are the smallest ground-edge stone implements made by the aborigines. In the collection they are termed "skinning knives," "flaying knives," and "skin dressers." There is unfortunately scant information available in regard to the type of implement used by the aborigines for skinning and dressing. Where such are recorded for cutting flesh, they are almost invariably described as "sharp flints" or "chips of stone."

In some parts of Queensland the human corpse was skinned with a stone knife[1]; McDonald describes the flaying of a corpse on the Mary River.[2] For this process a metal knife was used, but obviously this had replaced a stone implement.[3] This operation takes place in other parts of Australia also.

Brough Smyth figures a "Chip dug out of a mirrn-yong heap . . . it has a tolerably sharp cutting edge, and appears to be a fragment of chert. It had not been ground or polished, and the fracture is semi-conchoidal. I was quite sure that it was an ancient chip that had been used in cutting open and skinning animals taken in the chase."[4] Dawson says of the Victorians:—"For skinning animals, marking rugs, and cutting the human skin to produce ornamental wens on the chest, back and arms, knives are made of splinters of flint, or of sharpened mussel shells. . . . For skinning the ring-tailed opossum and for dividing meat, the leaf of the grass-tree is used, and also the long front tooth of the bandicoot, with the jaw attached as a handle."[5] Amongst the Narrinyeri in

[1] Barron Field.—*Geogr. Mem.* 1825, *pp.* 71-76; Roth, North Queensland Ethnogr., Bull. 9, in *Rec. Austr. Mus.*, VI, 5, 1907, pp. 398-403.
[2] McDonald.—*Journ. Anthr. Inst., I,* 1872, pp. 214-19.
[3] Curr.—*The Australian Race,* Melbourne, 1887, III, pp. 136-47, and p. 166.
[4] Brough Smyth.—Aborigines of Victoria, I, 1878, pp. 361-2, 381-2, figs. 210 and 217.
[5] Dawson.—Australian Aborigines, 1881, p. 25.

South Australia[6] "opossum skins, after they were dried, were carefully scraped, then scored on the fleshy side with a sharp stone or shell to make them flexible." These are figured by Howitt.[7]

Spencer says "Sundry stone chips were collected. . . . In other cases I am obliged to rely on the diagnosis of our black tracker who referred them variously as having been intended for the purpose of skinning animals, scarring of the body, cutting one another in play, scratching marks on weapons and making of spears. The materials of which they are composed are sandstone-grit . . . jasper, chalcedony, quartzite, porcellanite, and bottle glass. . . ."[8] According to Basedow "The old Adelaide Plains tribe were in possession of scrapers which they constructed out of thin slabs of clay-shale. The implement was more or less semi-circular, but had a concave surface on the inner side; occasionally its corners were rounded off, producing a reniform shape. On an average the diameter was something like four or five inches. This implement was used exclusively to scrape skins of animals. . . ."[9] Small circular discs of silex sharpened at the edge, Buyoa, are used for tattooing, or making other incisions in the body. . . ."[10] Van Gennep says stone knives were used for marking opossum skin cloaks."[11]

During a short stay at Bateman's Bay, New South Wales, the late W. W. Thorpe handed to an old native an *elouera*, a specialized type of knife-like scraper.[12] Without prompting, the old black recognized it as a skin scraper as used by the aboriginal women. He "had often seen his mother using them."

Mr. K. G. Goddard, resident in the East Kimberleys, in a letter to his brother, Mr. R. H. Goddard, makes the following observations:—"The small ground knife (Pl. vii, fig. 13) is used in ceremonial work by the medicine men, and also in the preparation of water bags of wallaby, kangaroo, or opossum skins. The skin is turned inside out, and stretched out on sticks. It is then scraped carefully with the small stone knife to remove the fat and any flesh adhering, the extremities are cut off, and all the openings except one are sewn up. The vessel is now ready for use." The same informant has also seen the natives of the East Kimberleys using rough scrapers (Pl. vii, fig. 17) for skinning and cutting flesh.

Bonwick says the Tasmanians did not skin animals before cooking, but used a "sharp flint" to eviscerate them.[13] Ling Roth mentions "chips of rock" being used for the skinning of animals, and that the implement is held by the forefinger and thumb, and the arm, being extended, was drawn rapidly towards the body."[14] The Tasmanians however did not use ground-edge implements.

Distribution.—The ground-edge knives figured are from various localities in New South Wales and from East Kimberleys, but in a letter Mr. A. S. Kenyon, of Melbourne, states that they are found co-extensive with the ground-axe, and occur most thickly in the Lower Wimmera, Victoria, Lower Murray, and Lower Darling areas, N.S.W. They have been found in rock-shelters (in some instances associated with burial), in camping places, and on coastal kitchen middens. In section they are all very thin, as will be seen from the illustrations. Details of measurements and weight are given in the explanation of plates.

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[6] Taplin.—Native Tribes of South Australia, 1879, p. 43.
[7] Howitt.—Native Tribes of South-East Australia, 1904, pp. 741-2, fig. 50.
[8] Spencer.—Report on the Horn Exped. to Central Australia, 1896, Pt. iv Anthropology, p. 98, pl. vi, fig. 18.
[9] Basedow.—Australian Aboriginal, 1925, p. 366, pl. xliii, fig. 3.
[10] Robertson.—Brief Account of the Natives of West Australia—Sydney, 1879, 8vo.; Perth, 1879, p. 15.
[11] Van Gennep.—Publ. Mus. d'Ethnogr. Pays Bas, Leyde, 14, 1907, p. 3.
[12] Turner.—Mankind, 1, 2, July, 1931, p. 32 and figs.
[13] Bonwick.—Daily Life of the Tasmanians, 1870, p. 18.
[14] Roth.—Aborigines of Tasmania, 1890, pp. 157-8.

Type I.—Pl. vii, figs. 1-9a, are all flaked, either from a larger flake, or from a pebble. There is no uniformity in shape or pattern, each being roughly fashioned, and only on one is there provision for gripping. In some cases they are hafted, as in Pl. vii, fig. 22. Each has a very good cutting edge, ground on both faces, which may be restricted to one end, as in the majority, to one side as in Pl. vii, fig. 4, or may extend halfway round, as in fig. 15, until in fig. 16 it culminates in the cutting edge right around. Pl. vii, fig. 2, is evidently a chip from a ground axe, and has two cutting edges. Figures 10–14 of the same plate, in the collection of Mr. R. H. Goddard, are all waterworn pebbles, and have been ground at one end on both faces, to produce a perfect working blade, but none of them have been otherwise shaped. Of these Mr. A. S. Kenyon says: "The material is in general exceptionally good . . . they are found where chipped or flaked quartzite knives abound and are used. This may be considered true, to a large extent, of all these small forms. The Lower Darling (N.S. Wales) ones, which resemble the Kimberley forms, are from the method of grinding quite often facetted and sometimes have two or more working or cutting edges." Plate vii, figs. 18–21, are flakes ground on one edge, and are chisel-like in shape.

Type II.—These are from western New South Wales. They are made from a very fine-grained highly altered volcanic ash, which can be ground to a very keen edge, as in the specimens available. One (pl. vii, fig. 23) in the collection might be termed a chisel, as it measures $5\frac{3}{4}$ x $1\frac{1}{8}$ x $\frac{3}{8}$ inches, and is ground at one end. Another, $3\frac{1}{4}$ x $1\frac{1}{8}$ x $\frac{3}{8}$ inches, is ground at both ends, having four facets to each working edge.

Type III.—Pl. viii, figs. 1–6a consists of a series of thin-bladed implements of this type, but they are much bigger, attenuated, and more uniform in shape than the smaller ones, due perhaps to the type of pebble used. It is possible to arrange a series from the smallest specimen to one described and figured by Etheridge, of which he says:—"The general form of this weapon is that of an elongated parallelogram, the longer sides quite parallel, and one end ground to a small cutting edge on both faces. It is nine and a quarter inches long, two and a half inches wide, only three-eighths of an inch in thickness, and its weight is eight ounces. . . . It may have been used for skinning, and other similar purposes, as its obvious weakness would ill fit it for the heavy work to which the blacks put their tomahawks. . . ."[15] In some cases these are flattish pebbles, ground at one end, in others they are either flakes, or have been flaked down to the necessary thickness, as with the smaller form. Such a series is, however, purely incidental, as the small ground-edge knife is a distinct type of implement.

Conclusion.—Etheridge refers to these implements as skinning knives,[16] but Kenyon and Stirling, in their "Suggested Classification of Australian Aboriginal Stone Implements," classify them as "knives or scrapers."[17] From the evidence available it is apparent that they are used for skin-dressing and scraping, and probably for the cutting of the *waribruk* scorings on skins used for cloaks (for which purpose shells were also used). However, the uses to which the aborigine applies an implement is limited only by its suitability for the purpose, and these implements are undoubtedly used for a variety of other purposes, such as cutting scars on the body or cicatrization, incised decoration on weapons, and numerous others, just as is the flaked quartzite knife in North and Central Australia, to

[15] Etheridge.—Proc. Linn. Soc. N.S.W. (2), v. 2, 1890, pp. 201-2, pl. xiii, fig. 11.
[16] Etheridge.—Rec. Geol. Surv. N.S.W., i, 2, 1899, p. 141 (figured pt. 1, pl. i, figs. 6-7; pt. 2, pl. xx, fig. 3).
[17] Kenyon and Stirling.—Proc. Linn. Soc. N.S.W. (2), xiii, 2, 1901, pp. 195-200.

which these implements might be compared. It seems desirable that they be termed Ground-edge Knives. Their use for circumcision is problematical; it was not practised in south-eastern Australia, throughout which area these implements are found. They have been referred to as "toy" tools, and "piccaninny's tomahawks," and while they may have been used by the boys their comparative rarity indicates a more important use, therefore these terms are not suitable.

2. Unusual Ground-edge Implements.

(Pl. ix.)

There are a number of specimens of this unusual type of ground-edge implement in the collection of the Australian Museum from various localities in New South Wales, as given in the explanation of plates. The side of the piece of stone has been utilized for the blade, instead of the end, as in the normal ground axe. In section they vary a great deal, but the majority taper from a thick back to the cutting edge. They are very irregular in shape, a series being figured. Some are flaked to the required shape, as in Fig. 1, but others are unworked (except the ground-edge), as in Fig. 3. Of the eighteen available some are of sandstone, others of basaltic and igneous rock.

As will be apparent from the localities given, they are not merely a local variation of the normal type of ground axe, but are, it seems, an implement made for a definite purpose. In the collection they are termed skin-dressers, a purpose for which they are eminently suitable, and which was their most probable use. Etheridge[18] suggests that they were used for skinning, otherwise no reference to them has been found.

EXPLANATION OF PLATES.

PLATE VII.

Ground-edge Knives.

Fig. 1.—Graytown, Victoria. Indurated slate. 6½ x 4½ x 1 cms. 1¼ oz. E. 13680.

Fig. 2.—Between Lachlan and Darling Rivers. N.S. Wales Felsite. 4¾ x 4¾ x 1 cms. 1 oz. B. 8552.3.

Fig. 3.—Lake Lonsdale, Victoria. Basic igneous rock. 5¾ x 4⅜ x 1¼ cms. 1½ oz. E. 34954.

Fig. 4-4A.—Between Lachlan and Darling Rivers, N.S. Wales. Felsite. 5 x 4½ x 1 cms. 1 oz., B. 8552.4.

Fig. 5.—Newfoundland Holding, Darling River, N.S. Wales. Felsite. 5¼ x 4 x 1½ cms. 1¾ oz. E. 27264.

Fig. 6.—Moora East, near Rushworth, Victoria. Lydian stone. 4¼ x 3½ x 1 cms. 1 oz. E. 13668.

Fig. 7.—Coonamble District, N.S. Wales. Lydian Stone. 4¼ x 3⅛ x 1 cms. ½ oz. E. 24410.

Fig. 8.—Newfoundland Holding, Darling River, N.S. Wales. Lydian stone. 3½ x 2¼ x 1¼ cms. ½ oz. E. 27265.

Fig. 9-9A.—Glenmore, Forbes, N.S. Wales. Basic igneous rock. 5¼ x 4½ x 1 cms. 1 oz. E. 34876.

Fig. 10.—Wollombi, N.S. Wales. Quartzose rock. 6¾ x 5¼ x 1 cms. 2½ oz. Lent by Mr. R. H. Goddard.

Fig. 11.—Bungaree, North Coast, N.S. Wales. Quartzose rock. 5¾ x 2¾ x 1¼ cms. 1 oz. Lent by Mr. R. H. Goddard.

Fig. 12.—Broulee, South Coast, N.S. Wales. Quartzose rock. 5¾ x 2¾ x 1 cms. 1¼ oz. Lent by Mr. R. H. Goddard.

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[18] Etheridge.—Rec. Geol. Surv. N.S.W., I, 1, 1889, p. 12, pl. i, figs 4-5; pt. 2, 1889, p. 144, pl. xx, fig. 4; *ibid.* i, 2, 1889, p. 292, pl. xiii, fig. 12.

Fig. 13-13A.—East Kimberleys, Western Australia. Quartzose rock. 6½ x 3¾ x 1¼ cms. 1¾ oz. Lent by Mr. R. H. Goddard.

Fig. 14.—Nandewar, N.S. Wales. Felsite. 5¼ x 3 x 1¼ cms. 1 oz. Lent by Mr. R. H. Goddard.

Fig. 15.—No locality. 4¼ x 3¾ x 1 cms. E. 20504.

Fig. 16.—No locality. 3¼ x 2¾ x ¾ cms. E. 20503.

Fig. 17.—East Kimberleys, Western Australia. Chalcedony. 3½ x 3 x ¾ cms. ½ oz. Lent by Mr. R. H. Goddard.

Fig. 18.—Avalon Station, Eugowra District, N.S. Wales. Lydian stone. 6¼ x 2 x ¾ cms. ½ oz. E. 34139.

Fig. 19.—Liverpool Plains, N.S. Wales. Lydian stone. 7 x 3¼ x 1 cms. 1¼ oz. B. 4545.

Fig. 20.—Between Lachlan and Darling Rivers, N.S. Wales. Lydian stone. 4¼ x 2¼ x 1 cms. ½ oz. B. 8552.7.

Fig. 21.—Mundadoo, Brewarrina District, N.S. Wales. Lydian stone. 2¾ x 2¼ x ¾ cms. ¼ oz. E. 26958.

Fig. 22.—N.S. Wales (1885). Highly altered volcanic ash. 5¾ x 1⅛ x ⅝ inches. B. 5930.

Fig. 23.—Lachlan and Darling Rivers, N.S. Wales. Basalt. Length (including handle), 8¾ inches.

PLATE VIII.

Ground-edge Knives.

Fig. 1.—Gilmore, Tumut District, N.S. Wales. 4 x 2½ x ¾ inches. 7 oz. E. 29258.

Fig. 2.—Cairns, Queensland. 4⅝ x 3½ x ½ inches. E. 2839. Ground on both faces of three edges. 8½ oz.

Fig. 3.—Rock Shelter, Kanangra Walls, N.S. Wales. 3⅜ x 1¾ x ⅜ inches. 2 oz. E. 34950. The curious markings on this specimen resemble those on some of the cornute and cylindro-conical stones of Western N.S. Wales.

Fig. 4-4A.—Queensland. 5 x 2⅛ x ⅝ inches. 7½ oz. E. 20481.

Fig. 5.—Holbrook, N.S. Wales. 3¾ x 1¾ x ⅝ inches. 3½ oz. E. 12286.

Fig. 6-6A.—Mt. William, Victoria. 3¾ x 2 x ½ inches. 3 oz. E. 32628.

PLATE IX.

Skin Dressers.

Fig. 1.—Shellharbour, N.S. Wales. Basalt. 11 x 6 x 2 cms. 7 oz. Lent by Mr. A. E. Ivatt.

Fig. 2.—Lower Murray River, South Australia. Quartzite (?). 10½ x 5¼ x 1 cms. 2½ oz. E. 20499.

Fig. 3.—Bulga, Singleton, N.S. Wales. Basalt. 12 x 6½ x 2 cms. 8 oz. E. 25985.

Fig. 4.—Rock Shelter, Mangrove Mountain, N.S. Wales. 11 x 6½ x 2½ cms. 6½ oz. E. 33475.

Other N.S.W. localities of specimens not figured are:—E. 30958, Shellharbour, Basalt; E. 33474, Rock Shelter, Mangrove Mountain, Porphyry; E. 33475, Rock Shelter, Garie, Basalt; Mulgoa, E. 35194, Sandstone; Richmond River, Olivine Basalt, E. 10708.

THE CORRECT GENERIC NAMES FOR THE GRAMPUS OR KILLER WHALE, AND THE SO-CALLED GRAMPUS OR RISSO'S DOLPHIN.

By

TOM IREDALE AND E. LE G. TROUGHTON.

(The Australian Museum, Sydney.)

(Plate x).

Following upon the recent record of the stranding of a male and female "*Grampus*" *griseus* at Sydney,[1] joint consideration of the taxonomy of the genus *Grampus*, involving the correct name for the Killer Whale, has thrown considerable light on a complex synonymy which has left the respective names in doubt for over a century. In this regard, it may be noted that in the 1922 Guide to the British Museum collection of Cetacea alternative popular and scientific names are given thus, "Grampus or Killer (*Orcinus orca* or *Orca gladiator*)," for the Killer Whale, an uncertainty which this paper endeavours to remove.

An account of our conclusions derived from these investigations is now placed on record with a view to stabilising the generic name to be employed for the Killer Whale or Grampus, and providing a tenable name for the dolphin to which the name grampus has been popularly applied by authors since 1828, and which is sometimes known as Risso's Dolphin.

Genus **Grampus** Gray.

1787, "Grampus" Hunter, Phil. Trans., xvi, p. 306 (307, 308, 322, 329, 350), pl. v, figs. 1–2.

1828, *Grampus* Gray, Spicilegia Zoologica, pt. 1, p. 2. Type by tautonomy, and subsequent designation (Zool. Journ., iv, 1829, p. 497), *Delphinus grampus* "Linn" = Hunter.

1846, *Orca* Gray, Zool. "Erebus" and "Terror," i, p. 33 (not *Orca* Wagler 1830). Type by tautonomy *Delphinus orca* Linn.

1860, *Orcinus* Fitzinger, Wiss.—Populare Naturgesch. Säugethiere, vi, pp. 204–217 (not *Orcynus* Cuvier, a fish); Id., Palmer, Proc. Biol. Soc. Wash., xiii, 1899, p. 24 (name revived).

1868, *Ophysia* Gray, Synopsis Whales and Dolphins in B.M., p. 8. Type by monotypy *Orca capensis* Gray.

1870, *Gladiator* Gray, Proc. Zool. Soc., p. 71. Type by monotypy *Orca stenorhyncha* Gray.

References in literature from the early sixteenth century, quoted in Murray's New English Dictionary, make it clear that the name "Grampus" was commonly applied to various cetaceans. Murray further states that "In popular use, the name (Grampus) seems to be most frequently applied to the formidable 'Killer' (*Orca gladiator*)." It is clear that it was thus used by Hunter, and accepted by many later authorities, who recognized the good figure given by Hunter as applicable.

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[1] Troughton.—Proc. Zool. Soc., 1931, pp. 565-569, pl. i, figs. 1-3.

Hunter used the name Grampus for a group of whales, which we would call a genus, thus (p. 308):—"the Grampus, which is an extensive genus, is probably from 20 to 50 feet long; under this denomination there is a number of species. From my want of knowledge of the different genera of this tribe of animals, an incorrectness in the application of the anatomical account to the proper genus may be the consequence; for when they are of a certain size, they are brought to us as porpoises; when larger, they are called grampus, or fin-fish."

Writing of the dentition and food of whales, Hunter definitely linked the name grampus with the Killer, and excluded Risso's Dolphin, when stating (p. 322) that "Some catch their food by means of teeth, which are in both jaws, as the porpoise and grampus; in others, they are only in one jaw, as in the spermaceti whale," and further (p. 329) that "In the stomach of the large bottle-nose, I found the beaks of some hundreds of cuttle-fish. In the grampus I found the tail of a porpoise; so that they eat their own genus." It is hardly necessary to stress the fact that absence of teeth in the upper jaw, and a squid or cuttle-fish diet, are characteristic of Risso's Dolphin, not of Hunter's grampus and the Killer Whale.

In the text and explanation of plate Hunter indicated that his grampus were much large than the Cuvier-Risso Dolphin when he wrote (p. 307) "Of the grampus I have had 2; one of them 24 feet long, the belly of a white colour, which terminated at once, the sides and back being black; the other about 18 feet long, the belly white, but less so than in the former, and shaded off into the dark colour of the back." The maximum length quoted for Risso's Dolphin is 13 feet, to which it doubtfully attains, while the colour shows none of the strong demarcation of black and white which is characteristic of the Killer.

Of Hunter's two "grampus," the large animal of Figure 1 is undoubtedly the Killer. The smaller "grampus" of Figure 2 was included by Gray[2] in 1866 as doubtfully synonymous with *Grampus cuvieri* = *griseus*. However, he had previously indicated in 1846 (*loc. cit.*) that he had examined the skull of the small grampus of Hunter, which he named *Globiocephalus affinis* and stated was probably a young specimen of *G. Svineval* = *G. melas*, the Pilot Whale or Blackfish. Actually, years prior to this, Lacépède in 1804 ("Histoire Naturelle des Cétacés", p. xliii) had given the name *Delphinus ventricosus* to the figure of Hunter's smaller grampus, so that if the figure were applicable to the Cuvier-Risso Dolphin, Lacépède's name would supersede *griseus*, which of course it does not do. It is clear, therefore, that of Hunter's two figures of grampus one represents the Killer Whale and the other a Blackfish, and that neither is applicable in any sense whatever to the dolphins of Cuvier or Risso.

In 1817 Desmarest ("Nouveau Dictionnaire d'Histoire Naturelle," nouv. ed., ix, p. 168) called Hunter's large species *Dauphin grampus*, *Delphinus grampus* of Hunter, which he closely compared with the "dauphin gladiateur," especially in coloration, but noted differences, derived from the figures of Hunter and Lacépède, which prompted him to regard them as separate species.

The name *Grampus* was introduced as a subgenus by Gray in 1828 in his Spicilegia Zoologica when he first subdivided the whales. It is essential to note that in a review of the "Spicilegia" in the following year (*Zoological Journal*, iv, p. 496–7) the typical species was stated to be "*Delph. Grampus* Linn.," which had been listed by Gray under the subgenus.

Apparently there is no species so named of Linné, and as Gray was notorious for careless writing and not reading proofs carefully, it is most probable that the

[2] Gray.—British Museum, Cat. Seals and Whales, 1866, p. 296.

familiar "Linn." was merely a simple error for the less usual abbreviation of "Hun." for Hunter, from whom Desmarest had acquired the specific name *Delphinus grampus*.

It is quite evident that the word grampus was associated by French and English authors alike with the Killer many years before the dolphin was discovered and described by Cuvier in 1812. Consideration of all authorities, including Gray himself, shows that Hunter's grampus was recognised as the Killer, and therefore the basis of *Grampus* Gray must be that of the tautonymic type.

In 1846 Gray[8] gave a sketch of the British cetacea based upon his researches, later published in full in the Zoology of the "Erebus" and "Terror." Absolutely ignoring his article of the Spicilegia Zoologica, he introduced the generic name *Orca* for the *Delphinus orca* of Linné, and noted Hunter's figure in this connection. He then introduced the name *Grampus cuvieri* for the *Delphinus griseus* of Cuvier, the specific name being changed because the animal was not grey but black.

The transference of generic names, however, was due to Gray meanwhile having noted that Rondelet a hundred years previously had used *Orca* as a group name for the Killer. He therefore concluded that the name was appropriate for the genus, having been used specifically by Linnaeus, and that his name *Grampus* was superfluous in this connection. In an endeavour to preserve the latter name he transferred it to the Cuvier-Risso dolphin, and thereby caused the confusion which persists to the present day.

From the foregoing account it is clear that in correctly allocating the generic name *Grampus*, the "*D. grampus* Linn." must be reckoned with as the tautonymic type. Even if the authority be not immediately accepted as a misprint for Hunter, the tautonymic status is readily established by means of the later work. Consequently, the generic name to be used for *Delphinus orca* Linné must be *Grampus*, and therefore the "*Grampus*" of recent authors requires a new generic name.

Some time after this account had been written, a small book in the Museum library, "Mammalia, Recent and Extinct; an elementary treatise for the use of the Public Schools of New South Wales," by A. W. Scott, M.A., 1873, was found to belie the sub-title in providing a remarkably complete account of the seals, dugongs, and whales. Publication in Sydney under the misleading title has resulted in the book being overlooked by all workers in the group, and we were astonished to find (pp. 103–4) the following statement which accords so well with the conclusions already reached by us:—

"The term *Grampus* (*great fish*) is, and has been, in scientific works, and in general conversation, very universally applied to denote among the odontocete the formidably dentated animal, the Killer; and that of *Blackfish* to distinguish the cetaceans of milder propensities and of greater usefulness to man, such as the sperm, the caa'ing, and some other whales. Dr. Gray's present arrangement of the grampidae abruptly ignores this common understanding among people of many nations, and brings together under the old familiar names a group of beings, whose every trait of character is of exactly a contrary nature to that of the savage gladiator, and to whom the word Blackfish would have been much more suitable. In looking over the Catalogue of Seals and Whales, I find therein the following generic names: *Hunterius, Macleayus, Eschrichtius, Cuvierius,* and *Sibbaldius;* why not, in order to restore the Grampus to its original standing,

[8] Gray.—Ann. Mag. Nat. Hist., xvii, Feb., 1846, pp. 82-85.

and also as being appropriate, substitute the generic name now employed for that of *Grayius*, in honour of one distinguished in every branch of zoology, but more particularly so in this, the marine mammalia?"

It is indeed interesting to note how clearly Scott understood the confusion and its cause, though when it is considered that the quotation is from a work intended as an elementary treatise for schools, one wonders what standard was expected of the scholars.

Grampidelphis gen. nov.

1846, *Grampus* Gray, Ann. Mag. Nat. Hist., xvii, Feb., 1846, p. 85, and Zool. "Erebus" and "Terror," i, p. 30. Not *Grampus* Gray, Spicilegia Zoologica, 1828, p. 2.

1873, *Grayius* Scott, Mammalia, Recent and Extinct, p. 104, new name for *Grampus* Gray 1846 and later, not of Gray 1828. Preoccupied by Bonaparte 1856, Günther 1858, Bate 1862.

The characters of the genus are too well known to require description, and it has been clearly demonstrated above that in regard to size and dentition alone the dolphins described by Cuvier and Risso cannot be reconciled in any way with the two kinds of grampus figured by Hunter. Such confusion as to identity was increased by some authors wrongly identifying the smaller animal of Hunter's figure 2 with the Cuvier-Risso dolphin.

Gray in the "Zoology of the 'Erebus' and 'Terror'" bases his new *Globiocephalus affinis* upon the skull of the small Hunterian grampus. Most authors have overlooked the fact that Lacépède's *Delphinus ventricosus* was in 1804 applied to this small Hunterian grampus, so that if the figure of the latter were applicable to the Cuvier-Risso Dolphin, *ventricosus* should have superseded Cuvier's *griseus*. Gray, however, in his description suggested that his *G. affinis* was "probably a young specimen of *Globiocephalus Svineval*," which has since been commonly accepted. The good figure 2 of Hunter clearly represents the Blackfish rather than the Cuvier-Risso dolphin, while the cranial and dental characters determine the specific identity with *melas*. The name *svineval* has been rejected altogether in favour of *melas* Traill which is years later than Lacépède's name, which must be revived for the common Blackfish, now to be known as *Globicephalus ventricosus*. The generic name must be *Globicephalus* Hamilton 1836[4], ex Globicephale Lesson vernacular, not *Globicephala* as used in the 1922 British Museum Guide to the exhibited cetacea, probably following Palmer.

Instancing Gray's casual methods we find in the 1866 Catalogue the description of a new species *Grampus affinis*, which upon investigation proves to be based upon the description of the same author's previously named *Globiocephalus affinis*, which is also listed in the same Catalogue under the latter name. Apparently Gray picked up the description written out under the heading *G. affinis* and concluding that the *G.* stood for *Grampus*, inserted it under that genus as well. He had previously drawn up the description in full under *Globiocephalus* and this was entered in its correct sequence. These facts are evident not only from the description, but also from the identical measurements.

While abroad during 1930 Troughton examined various specimens and concluded that none of the crania were in complete agreement with the Australian ones. In view of the extraordinary confusion and doubt enveloping the forms of this genus, and in order, therefore, definitely to establish the generic name, *Grampidelphis* is founded upon the local form as described hereunder.

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[4] Hamilton.—Nat. Libr. (Jardine), Whales, 1836, p. 212.

Grampidelphis exilis sp. nov.

(Plate x, figs. 1-5.)

1931 *Grampus griseus* Troughton (nec Cuvier), Proc. Zool. Soc., pp. 565-569, pl. i, figs. 1-3 (animal).

Diagnosis.—Lighter areas of ventral surface in male and female so restricted as to warrant the general description of being almost entirely black. A marked subtriangular groove or concavity in the anterior surface of the head. The pterygoids are differently shaped, and the teeth apparently much heavier than in other forms.

Skull and dentition.—The pterygoids of both the male and female are very similar and are consistent in being considerably more elongate, and differently shaped to those of *G. griseus* figured in the "Atlas"[5] (pl. liv, fig. 7a); the apices posteriorly are more acutely pointed, with the result that the lateral emarginations appear to be far more extensive, while anteriorly the bases are also narrower. The pterygoids differ from those of the young Concarneau specimen figured as *griseus* in the "Atlas" (pl. lxiv, fig. 4a) in lacking the even convexity of the inner margins as shown in the figure, in which the apex of the angle is almost at the centre of the inner margin, instead of being opposite the posterior fourth.

Teeth, 3–4 in the female holotype and 4–4 in the allotype male, apparently larger than in any other form of the genus, and much larger than in the Table Bay specimen. The antero-posterior diameter of the smallest tooth, the 4th in the right ramus, is 10.6 mm., and that of the largest, 2nd in the left ramus, is 14 mm.; the transverse diameter of these teeth is 9.7 and 14.5 mm. respectively, the transverse diameter usually being larger than the antero-posterior. True listed the "diameter of the mandibular teeth" of the Table Bay specimen as 7.6 mm., and stated in his description that they were as large as in the American series; he unfortunately did not list any teeth dimensions of the American series, but if his statements are correct, the teeth of the Australian specimens are very much stouter than those of the South African specimen, and apparently the American ones as well.

External features.—There is a marked subtriangular groove or concavity on the front of the head which is not shown in figures of *griseus* and, apparently, has previously been noted only by Flower, who described the anterior surface of the head as "somewhat hollowed in the middle line." In the specimens of *exilis* the head is distinctly hollowed, the rostral depression extending from about 3 inches from the snout-tip to the dorsal plane of the head, the length being about 7½ inches, the depth about one-half inch, and the greatest width about 2½ inches, from the centre of the ridges on each side. The dorsal fin is placed much further back than in Flower's well-known figure of *griseus*,[6] in which the origin of the dorsal is situated much nearer the snout than the tail-base, whereas it is almost exactly midway between the snout-tip and tail-base in *exilis*; the predorsal profile, therefore, appears much longer in the Australian form. The difference is further indicated in that in the *griseus* figure the pectoral fin almost reaches back to the vertical of the origin of the dorsal, whereas in *exilis* it falls far short of it.

Colour.—The female holotype soon after capture: Pectorals, dorsal, and tail black. Back and sides uniform black to a level with the anterior bases of pectorals, which are not mottled; anteriorly there is a greyish tinge which tends to form a faint triangular mark on each side of the head, and is continued around

[5] Beneden and Gervais.—Ostéographie Cétacés. Atlas, 1866-79.
[6] Flower.—Trans. Zool. Soc., viii, 1872, pl. i, fig. 1.

behind the blowhole in a narrow line. The apex of the snout above and below shows the dark coloration, but the sides of the mouth to the top of the head, and the undersurface of the jaws, are so closely striated with white lines as to suggest large whitish areas, though obviously the lines are due to injuries inflicted by the living prey. From chin to front of pectorals the undersurface is mottled with dirty white, thence being black to a level with the anterior origin of the dorsal fin, the remainder of the undersurface posteriorly being of a dirty white tinged with the black of the upper surface. The lighter areas of the ventral surface are so restricted, however, that both male and female may be generally described as almost entirely black.

External dimensions.—Female holotype: Total length in straight line from snout to caudal notch, 9 feet 10 inches; to eye, 13½ inches; to blowhole, 18¾ inches; to anterior base of pectoral fin, 26 inches; to anterior base of dorsal fin, 4 feet 4 inches, in straight line; 4 feet 6½ inches along curve; length of pectoral along centre, 20½ inches; greatest width, 8½ inches; vertical height of dorsal fin, 14 inches, along curve 24 inches; width of tail, 2 feet 6 inches.

Typical specimens.—Holotype female represented by a coloured cast and complete skeleton, registered S. 1776; allotype male skull No. S. 1832, both in the collection of the Australian Museum.

Localities.—Holotype female stranded on the Ocean Beach at Manly, Sydney, N.S.W., on the 28th February, 1927. Allotype male stranded on Dee Why Beach, a few miles north of Manly, on the 18th February, 1929.

The first Western Australian record is provided by a complete skull washed up on a beach to the north of the River Vasse estuary, Geographe Bay, south Western Australia. The South Australian record of a specimen near Adelaide, by Zietz in 1889, cannot now be verified as no characters were given and the specimen cannot be traced.

Remarks.—The circumstances of their stranding would suggest that both Sydney animals were weakened by sickness or prolonged attack during a regular migration southward around Australia. In any event, the occurrence of a second specimen, of opposite sex, two years later in the last fortnight of February, would seem to imply an annual migratory movement. There is, indeed, a distinct possibility that the migrations of forms are more restricted than True's conception of the genus would admit, and that, notwithstanding his remarks on the striking variability of his Cape Cod series, diagnostic differences may yet be found to separate specimens from distant regions, when similar series are available. In regard to migrations within a restricted range, it may be noted that Beneden and Gervais stated that "Les Grampus dits de Risso, c'est-à-dire ceux de la Méditerranée, viennent régulièrement au printemps et en automne dans le golfe de Nice et dans le baie de Villefranche."

We are indebted to Mr. L. Glauert, B.A., Curator of the Perth Museum, for the opportunity to provide the first record of a grampus-dolphin from Western Australia. The complete skull was washed ashore to the north of the Vasse estuary in Geographe Bay, and was found and presented to the Museum in 1928. It was exhibited before the Royal Society of Western Australia by Mr. Glauert,[7] but is unfortunately only entered in the Proceedings as "a rare dolphin." Not only is the identification confirmed by photographs kindly sent by Mr. Glauert, but the general contour and proportions of the skull are shown to accord with the

[7] Glauert.—Proc. Journ. Roy. Soc. West Austr., xiv, 1928, p. xxiii.

New South Wales specimens; the pterygoids are destroyed, but the alveoli of the mandible are very large and leave no doubt that the teeth, four right and five left, were of the large size characteristic of the Australian form. The above specimen with the two Sydney ones provide the three verifiable records of occurrence of grampus-dolphin, hitherto known as Risso's Dolphin or Grampus, on the Australian coast.

Grampidelphis kuzira sp. nov.

Grampus sakamata Beneden and Gervais, Osteographie, 1880, p. 568, pl. lxiv, fig. 5. Not of Gray, Zool. "Erebus" and "Terror," i, 1846, p. 31.

General account.—According to the dimensions and figures, the Japanese skull differs considerably from the other known forms. The name ***sakamata*** **was** first formally used by Gray in 1846 for a whale described by Schlegel from Japanese drawings and natural histories. He had not seen any specimens, and as Gray did not even examine the original accounts from which Schlegel drew his description, the name *sakamata* has no standing. In view of this, True's statement that "I consider the skull figured by Gervais in the Osteographie . . . as a type of the so-called *Grampus sakamata*" cannot be sustained, and the above name is therefore provided for the figure which we consider to represent the skull of a distinct form.

Of their specimen Van Beneden and Gervais wrote "Le Grampus du Japon, que nous appellerons *Grampus Sakamata* pour nous conformer à la nomenclature de M. Gray, devra peut-être être considéré comme formant une espèce à part, ou tout au moins une variété bien distincte, et cette interprétation trouve en argument en sa faveur dans la forme de la partie faciale des os intermaxillaires étudiés dans leurs rapports avec la partie correspondante des maxillaires (Pl. lxiv, fig. 5); c'est, comme on le voit, une différence de l'ordre de celles que nous avons signalées chez les Globicéphales."

According to True, upon examining their figure "we are at once made aware of the inadvisability of basing species in this genus on the proportions of the skull alone, on account of the great amount of individual variation in cranial characters." He then attempts to discount the differences shown in the figure by listing two skulls of his Cape Cod series, the proportions of which are said to be common to the Japanese and Concarneau specimens, and which "might almost have served for the basis of these two figures." In making these comparisons, however, True was on uncertain ground when emphasising that "both our skulls and those figured in the *Ostéographie* are from young individuals."

In the cetacea particularly, it is between adults one should seek fair comparison, and it is clear that the two Cape Cod specimens were juveniles, of which True unfortunately did not list dimensions. The Concarneau specimen also was not adult, and as the Massachusetts series is apparently reconcilable with the European *griseus* similarities are to be expected. The Japanese skull, however, is definitely adult, and it is not reasonable to discredit its characteristics because they are reproduced to some extent in the young of an allied form when the crania of the young are admittedly most prone to variation.

A calculation of the dimensions of the quarter size figure in the "Atlas" shows the Japanese skull to have a total length of at least 488 mm. = 19¼ inches, and it is notable that only an additional 52 mm. = 2 inches is needed for the Japanese skull to equal the maximum length of the Cape Cod series, and actually to exceed the total length of the *souverbianus* skull, on the size of which that

species was based. It is therefore clear that True was wrong in regarding the Japanese skull as that of a young animal. In any event, he was comparing actual specimens with figures of others which he had not seen, and it is very probable that the length of the Japanese skull would be increased were the condyles shown in the figure.

There is either something misleading in the angles of the figure, or the supraoccipital region of the Japanese skull is very different. This is shown by comparison with the figures of *griseus* and *rissoanus* on plate liv of the Atlas, and by the tilting of actual skulls; if the condyles appear in a dorsal view the supraoccipital area naturally gains its fullest extent, whereas if the condyles are excluded the area is reduced to a narrow band. The figure of the Japanese skull reverses this in showing a wide supraoccipital area, though the condyles are excluded from view. Whether this is mere distortion or a further proof of distinction, the fact remains that inclusion of the condyles would normally increase the total length and, therefore, far from being that of a young individual, the Japanese skull was probably as large as the maxima of True or Fischer, thus further emphasising the unusual narrowness of the skull.

True stated that he did not examine the skull when in Paris and could not affirm that it may not exhibit characters not represented in the figure, but that until such were found he did not see why *sakamata* should be separated from *griseus*. On the contrary, the above account appears to nullify True's comparisons, and in view of the markedly narrower cranium and rostrum, and Van Beneden and Gervais' remarks when comparing the skull with many others, it seems impossible definitely to relegate the Japanese form to the synonymy of *griseus*. Therefore, as we have shown that the "Atlas" skull is not the type of Gray's *sakamata* which is thus without status, and because of the comparatively much narrower dimensions and the fact that were a series available, the pterygoids, teeth, and other characters might further support distinction, it seems advisable to distinguish the Japanese form for the present under the name provided.

Summary.

From a close review of the literature and complicated synonymy it is shown that the popular and generic term "grampus" must be restricted to the Killer Whale. It is evident that the name was associated with the Killer many years before the dolphins of Cuvier, 1812, and Risso, 1822, were discovered, and actually until Gray in 1846 transferred his generic use of *Grampus* from the Killer to the dolphin, in an effort to preserve the name which he wrongly supposed to have become superfluous for the Killer. While Gray's technical misusage of *Grampus* for "Risso's Dolphin" has since been followed, the common name grampus has still been used for the Killer. The technical name *Grampus* is now correctly applied to the Killer, and the new name *Grampidelphis* is introduced for the grampus-dolphin.

The Australian specimens are shown to differ from the northern "Risso's Dolphin" and are distinguished as a new species, *Grampidelphis exilis,* and the Japanese form is named *Grampidelphis kuzira.*

The correct name of the Killer, wrongly called *Orca gladiator* or *Orcinus orca,* is *Grampus orca* Linné. During this investigation it was found that *Delphinus ventricosus* Lacépède was based on the Pilot Whale or Blackfish, which must now be called *Globicephalus ventricosus.*

EXPLANATION OF PLATE X.

Grampidelphis exilis sp. nov.

Fig. 1.—Holotype female skull, dorsal view, Manly, near Sydney, N.S.W.

Fig. 2.—Allotype male skull, dorsal view, Dee Why, near Sydney, N.S.W.

Fig. 3.—Holotype female skull, ventral view, Manly, near Sydney, N.S.W.

Fig. 4.—Allotype male skull, ventral view, Dee Why, near Sydney, N.S.W.

Fig. 5.—Mandible showing the large tooth sockets; specimen from Geographe Bay, south Western Australia.

SYSTEMATIC NOTES ON AUSTRALIAN LAND SHELLS.

By

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Museum routine necessitates the determination of any molluscan material submitted, and many land shells and slugs are included. These have been a continual source of trouble, as Australian land shells have not been systematically studied recently. My predecessor, Mr. Charles Hedley, began his conchological career by the examination of molluscous animals, but at that time with very little knowledge of their shells and their importance. He soon found that the latter must be given much more value than had been anticipated, and began accumulating systematic data for the elucidation of our land molluscan fauna. It was a long and tedious task, and, unfortunately, when his goal was in sight his work was terminated by his death. The preparation of an illustrated monographic account was left as a legacy to me, and I hope to complete the work in the near future.

Unfortunately in the past it has been traditional to depreciate or entirely discount shell features, and utilize imperfectly understood anatomical features in order to group land mollusca. Modern malacologists now agree that shells, when correctly studied, are of great value, and that until the shell is accurately distinguished the anatomical data cannot be properly valuated. It is now necessary to separate a large number of small groups in which the shells may be ranged, and then, from a study of these restricted series, animal characters may be carefully examined and a sound classification formulated.

There are many pitfalls in the study of Australian land shells, and it has been a difficult matter to unravel the literary history of many of the species. The data collected will be published in full at the earliest opportunity, the present essay being merely an attempt to clear some of the difficulties out of the way. The most important works of reference are the following:—Pilsbry, Manual of Conchology, series 2, vol. ix; Cox's Monograph of Australian Land Shells; May's Mollusca of Tasmania and Illustrated Index; Hedley's Essays in the Records of the Australian Museum and in the Proceedings of the Linnean Society of New South Wales; Hedley's West Australian List; Tate's Report of the Horn Scientific Expedition; Cox and Hedley's Victorian Index, and now Gabriel's Catalogue of Victorian Land Shells. Other minor papers are referred to in the following pages.

Genus **Helicarion**.[1]

All Australian Vitrinid molluscs have been classed in this genus, and its range has now been extended into other countries, so that the name *Helicarion* has become almost as meaningless in systematic usage as *Vitrina*. Fortunately the type of Helicarion is the Tasmanian species *H. cuvieri* Ferussac,[2] so that in this respect we are on sound ground. From this species the magnificent Queensland species *H. superba* Cox[3] differs in the tenuity of the shell, the coiling, and the large size, and is here separated with the subgeneric name *Fastosarion*.

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[1] Ferussac.—Tabl. Syst. Fam. Limac. 1821, p. 20 (16), June.
[2] Ferussac.—Tabl. Syst. Fam. Limac. 1821, p. 20 (16), pl. ix, fig. 8, June: Austr.
[3] Cox.—Proc. Zool. Soc. (Lond.), 1871, p. 54 (June 12); Port Denison, Q'ld.

Anatomical investigation may show that a greater distinction is indicated, as very slight shell differentiation has been accompanied by great anatomical variation in this group. Thus from North Queensland Odhner[4] has named *Helicarion bullacea,* and has reported somewhat different animal characters, though the only superficial shell feature is the closer coiling, recalling more a Zonitoid. Subgeneric rank may, for the present, be allowed to this species, with the new name *Vercularion.* It will be remembered that Smith,[5] cataloguing the land shells of West Australia, observed that Vitrinids were absent from that part of our continent, but was corrected by Hedley,[6] who drew his attention to the species *Helicarion thomsoni* described by Ancey.[7] This species, which, theoretically, might be most closely related to the Tasmanian *H. cuvieri* Ferussac, differs from that species in its globose form, small mouth, and golden coloration, and may be proved very different anatomically, but here is only separated subgenerically as *Luinarion.*

Genus **Hedleyella.**[8]

The two magnificent shells, formerly known as *Panda,*[9] were lumped into one species by Hedley early in his conchological studies, but later research suggested revision. Not only are there two species, *falconeri* Gray[10] and *maconelli* Reeve,[11] but there are geographical races to be distinguished. Thus many years ago Cox noted that the most southern shells were much smaller, and gave a MS. name to these shells coming from the foot of Mount Royal, north-east of Singleton, N.S. Wales. In addition to their smaller size they are more conical, the umbilicus narrower, the mouth less expanded than specimens from the Richmond River, N.S. Wales, which are very large, the mouth much expanded, the umbilicus correspondingly broader; the latter may be named *H. falconeri jacksoniana* nov., the type being a shell from near Booyong, measuring 90 mm. in width by 80 mm. in height, the coloration generally being darker than that of the typical series.

South Queensland shells approximate more in size to the typical form and show no signs of intergrading with *maconelli* Reeve, the elevated non-umbilicate species described from Brisbane, Moreton Bay, with which it was lumped by Hedley.[12] The South Queensland form of *falconeri* is reduced in size almost to that of the extreme southern form, but it is more elevated, with the mouth not so patulous, measuring 60 mm. in height and 55 mm. in breadth, the colouration being generally paler than that of typical shells. The Queensland subspecies may be named *H. falconeri imitator* subsp. nov. As no definite type locality was assigned to the species, the Clarence River is here arbitrarily selected. Hedley introduced two varietal names *azonata* and *tigris* for his conception of variations of the complex species (*falconeri* + *maconelli*) and as they were for simple colour variations, their type localities are here fixed as that of typical *falconeri,* and they will cause no further concern. In the same place Hedley gave an account of the anatomy of *Bulimus atomatus* Gray,[13] and concluded that it should be placed in *Panda* = *Hedleyella.* As the features he depended upon he also found present in

[4] Odhner.—Kungl. Sv. Vet. Akad. Handl. 52, 1917, p. 87, pl. 3, figs. 97-98, text fig. 4 (Sept. 19): Cedar Creek, N. Q'ld.
[5] Smith.—Proc. Malac. Soc. (Lond.), I, 1894, p. 85 (June).
[6] Hedley.—Proc. Malac. Soc. (Lond.), I, 1895, pp. 259-60 (July).
[7] Ancey.—Le Naturaliste, 1899, p. 19: Geographe Bay, South W.A.
[8] Iredale.—Proc. Malac. Soc. (Lond.), xi, 1914, p. 174, Sept.
[9] Albers.—Die Heliceen, 2nd ed., 1860, p. 149.
[10] Gray.—Proc. Zool. Soc. (Lond.), 1834, p. 63 (Nov. 25): New Holland.
[11] Reeve.—Proc. Zool. Soc. (Lond.), 1851, p. 98, pl. xii, June 29, 1853: Brisbane, Qld.
[12] Hedley.—Rec. Austr. Mus., ii, 1892, pp. 26-31 (Aug.).
[13] Gray.—Proc. Zool. Soc. (Lond.), 1834, p. 64, Nov. 25: near Fort (?) Macquarie, N.S.W.

such diverse groups as *Pedinogyra*[14] and *Caryodes*, and he was not averse to including therewith *Anoglypta*, it is obvious that he was not dealing with a feature of merely generic value. Hedley also named two varieties of this species, *elongata* and *azonata*, the latter being nullified by his prior *azonata* above noted. The type locality of *atomatus* is the same as the type locality of *falconeri*, and this is named as the type locality of the two variations named by Hedley. At the same time Hedley discounted the specific value of *kershawi* Brazier,[15] described from the Snowy River, Gippsland, Victoria. In this he has been followed by Gabriel,[16] but on account of the great hiatus in their distribution, and the differences when series are contrasted, I would allow specific nomination. The shells are elongate, quite unlike *Hedleyella* in form, with no umbilicus at any stage of life, the columella almost truncate, the mouth narrow, the apex not planate, so that I propose the new generic name *Pygmipanda*, *atomatus* Gray being named as type. It may be noted that, although *Hedleyella maconelli* Reeve appears to be non-umbilicate when adult, the juvenile shows a narrow umbilicus exactly like that of the widely umbilicated adult *falconeri* Gray. Still more different is the exquisite little shell (little in comparison with *Hedleyella*) named *Bulimus larreyi* by Brazier,[17] which Hedley also placed in *Panda* without much comment. This species has a delicate thin texture, the mouth rather expansive but not umbilicate, and a major difference can be seen in the exsert incurved tip, quite unlike that of the planate protoconch of *Hedleyella*. It is therefore designated as the type of the new genus *Brazieresta* in honour of that great conchological collector, John Brazier, who discovered the species.

One of the outstanding discoveries of recent years was that of *Panda whitei* Hedley.[18] S. W. Jackson found this delightful little shell near Mackay, Queensland, and Hedley, instead of giving it at once a new generic name, placed it in *Panda* on account of its probable relationship. The shell is very small and thin, somewhat ear-shaped, with a short spire and a patulous aperture. The new generic name *Pandofella* is here provided for it, and thus the group *Hedleyella* is made available for correct appreciation. When *Panda* was used the distribution would have read "From Snowy River, Victoria, to Mackay, Queensland," which gave quite an erroneous impression of the facts. True *Panda*, *i.e.*, *Hedleyella*, ranges only from northern New South Wales into southern Queensland, while *Pandofella* is only found north of that range, and *Pygmipanda* only found southwards, the curious *Brazieresta* being restricted to northern New South Wales, in the Bellengen River district.

Genus **Paryphanta**.[19]

This Neozelanic genus has been utilized for the reception of certain Australian shells, found in Victoria and Tasmania. Superficially there are conchological characters that will enable distinction, and their anatomy has been investigated by both Neozelanic and Australian students, and many differential features recorded. As land snails are commonly cited in connection with zoogeographical problems it causes confusion if the generic names be loosely applied. Recent study by Powell[20] has brought to light many species and subspecies of *Paryphanta* in New Zealand, and even there generic distinction has been

[14] Albers.—Die Heliceen, 2 ed., 1860, p. 162.
[15] Brazier.—Proc. Zool. Soc. (Lond.), 1871, p. 641, May 2, 1872: Gippsland, Vic.
[16] Gabriel.—Proc. Roy. Soc. Vict., xliii (n.s.), 1930, p. 66, pl. iii, figs. 1-8; Sept. 11.
[17] Brazier.—Proc. Zool. Soc. (Lond.), 1871, p. 321, Aug. 16: Bellengen River, N.S.W.
[18] Hedley.—Proc. Linn. Soc. N.S.W., xxxvii, 1912, p. 254, pl. iv, figs. 1-4, Dec. 13: near Mackay, Qld.
[19] Albers.—Die Heliceen, 1st ed., 1850, p. 129.
[20] Powell.—Rec. Auckl. Mus. i, 1930, pp. 17-56.

proposed. The Victorian species, *Nanina atramentaria* Shuttleworth,[21] has only a small umbilicus and is separable from the Neozelanic type of *Paryphanta*, *H. busbyi* Gray,[22] by its size, shape, and sculpture, the latter consisting of concentric wrinkles on the upper surface, the lower being smooth. While tentatively allowing the grouping of this species under *Paryphanta*, the differences require the introduction of a new subgeneric name, *Victaphanta* for the Victorian species, the second Victorian species, *P. compacta* Cox and Hedley[23] being placed with it.

The Tasmanian species recently allotted to *Paryphanta* was described as *Vitrina milligani* by Pfeiffer,[24] and its conchological features approximate much more closely to those of *Helicarion* than they do to any group near *Paryphanta*. The shell is thin, scarcely calcareous, of few whorls, the last one very large with an open mouth, and the surface shining black. Were it not for this last feature, which is in disaccord with all Vitrinid shells, it would scarcely have been separated. Nevertheless anatomical research indicated its closer relationship with the group *Paryphanta*, though Murdoch,[25] who studied the anatomical features, pointed out certain important differences. The new generic name *Melavitrina* is here proposed for *V. milligani* Pfeiffer.

A curious reference to this genus by Petterd and Hedley[26] is that of *Helix dyeri* Petterd,[27] a very small shell of three millimetres only in major diameter. It has been well figured by these writers, but there seems little justification in attaching this minute shell to this group, and the new generic name *Prolesophanta* is proposed. The spire is a little elevated, the apical whorls roughened, the surface sculpture consists of fine radial growth lines only, the mouth is somewhat oblique, and there is no umbilicus.

Genus **Bothriembryon.**

This generic name was introduced by Pilsbry[28] to replace *Liparus*,[29] which had been incorrectly used for West Australian Bulimuloid snails. In his monographic account Pilsbry[30] pointed out that the nepionic sculpture, which he relied upon and indicated as the most valuable of shell features, varied appreciably in this series. Moreover he gave a key recording this variation as follows:—

Apex with close, waved, subvertical wrinkles—*gunni, onslowi.*
Apex with spaced subvertical wrinkles—*spenceri.*
Apex with wrinkles anastomising to form a network—*gratwicki.*
Apex with regular pitting—*kingi, dux.*

The lastnamed was the character of the type upon which *Bothriembryon* was based. Pilsbry did not emphasize the fact that the above noted variation coincided with geographical separation, which consequently increased its group value greatly. As a beginning we may grant them subgeneric value, though in

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21 Shuttleworth.—Mitth. Nat. Gesell. Berne, p. 194, 1853: Port Phillip, Vic.
22 Gray.—Ann. Mag. Nat. Hist. (1), vi, 1840, p. 317.
23 Cox and Hedley.—Mem. Nat. Mus. Melb., No. 4, 1912, p. 8, pl. i, figs. 3-5, Feb.: Otway Ranges, Vic.
24 Pfeiffer.—Proc. Zool. Soc. (Lond.), 1852, p. 56, March 22, 1854: Macquarie Harb., Tas.
25 Murdoch.—Trans. New Zeal. Inst., xxxviii. 1906, pp. 313-316, pl. xx.
26 Petterd and Hedley.—Rec. Austr. Mus., vii, 1909, p. 287, pl. lxxxvi, figs. 38-40, Aug. 30.
27 Petterd.—Mon. Land Shells, Tasm., 1879, p. 40, Apl.: Launceston, Tas.
28 Pilsbry.—Nautilus, viii, 1894, p. 36, July.
29 Albers.—Die Heliceen, 1st ed., 1850, p. 172.
30 Pilsbry.—Man. Conch. (2), xiii, 1900, pp. 1-19.

some cases this will doubtless be enhanced later. The true *Bothriembryon* is restricted to South-west Australia, and new names are introduced thus:

Tasmanembryon: type *tasmanicus* Pfeiffer[31]—Tasmania.
Hartogembryon: type *onslowi* Cox[32]—Shark's Bay, West Australia.
Larapintembryon: type *spenceri* Tate[33]—Central Australia.
Satagembryon: type *gratwicki* Cox[34]—East of West Australia.

In connection with these species the shells also show distinctive characters, and it is necessary to criticise these very closely in order to produce definite valuable data. Thus the Tasmanian shell has been called *gunnii* Sowerby,[35] a name given to an internal cast of a fossil which was found with another land shell which is certainly not living. The exact relationship of the fossil with the living species is therefore problematical in this case, and consequently Pfeiffer's name *tasmanicus* is preferred. It is further possible that the Tasmanian species is more nearly related to *Hedleyella*, or even *Placostylus* (s.l.), than to *Bothriembryon* typical, though it must be remembered that Hedley suggested that *Bothriembryon* and *Placostylus* were related. In the lastnamed group we have solid earth-living forms and thin, tenuous, tree living species. A curious item is the fact that May,[36] following Petterd and Hedley, give as the distribution East Tasmania only, though Legrand[37] definitely stated that he had received it from West Tasmania, and the statement has, as far as I can trace, never been denied.

Genus **Papuina.**

This large extra-limital group is represented in Australia by only a few species, each of which offers discordant features, suggesting that they are not closely related, but rather that they represent species derived from different groups. Hedley forty years ago also came to the above conclusion, but had not reviewed the forms subsequently. Mollendorff,[38] when dealing with New Guinea species, proposed to use *Insularia* Tapparone-Canefri[39] as well as *Papuina*,[40] but both were introduced with the same type, *lituus* Lesson, so the former cannot be maintained. At the same time Mollendorff suggested the name *Rhynchotrochus* for species of the *tayloriana* group, and therein appears to be included the Australian *H. macgillivrayi* Forbes,[41] but no other local species. Superficially *Helix bidwilli* Pfeiffer[42] recalls this group, but the shorter shell with more rounded whorls and the more open mouth, with only slight contraction of the outer lip, easily distinguishes it, and the subgeneric name *Papuexul* is proposed for Pfeiffer's species. There is a series of shells with a more elongate whorling and the mouth still more open with scarcely any contraction of the outer lip, and this is represented in Australian waters by *H. poiretiana* Reeve[43] and *Papuina nuensis* Hedley.[44] There does not appear to be any differential name available, so *Noctepuna* is here given, the Reevean species being named as type.

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31 Pfeiffer.—Proc. Zool. Soc. (Lond.), 1851, p. 260, Dec. 7, 1853: Van Diemen's Land.
32 Cox.—Cat. Austr. Land Shells, 1864, p. 24: Dirk Hartog 1, West Aust.
33 Tate.—Trans. Roy. Soc. South Austr., xviii, 1894, p. 192, Nov.: Central Austr.
34 Cox.—Proc. Linn. Soc. N.S.W., xxiv, 1899, p. 435, figs. in text, Dec. 9: East of Israelite Bay, S.W.A.
35 Sowerby.—Phys. Descr. N.S.W. (Strzelecki), 1845, p. 298, pl. xix, fig. 5 (6): Fossil, Tas.
36 May.—Illus. Index Tasm. Shells, 1923, pl. xlii, fig. 7.
37 Legrand—Coll. Mon. Tasm. Land Shells, 1871.
38 Mollendorff.—Proc. Malac. Soc. (Lond.), i, 1895, p. 237, Mch.
39 Tapparone-Canefri.—Ann, Mus. Civ. Genov., xix, 1883, pp. 115, 138.
40 Martens.—Die Heliceen (Albers), 2nd ed., 1860, pp. xiv, 166.
41 Forbes.—Narr. Voy. "Rattlesnake" (Macgillivray), ii, 1852, p. 278, pl. iii, fig. 1, Jan. 1: Frankland Is., Q'ld.
42 Pfeiffer.—Proc. Zool. Soc. (Lond.), 1853, p. 49, July 25, 1854: Wide Bay, Q'ld.
43 Reeve.—Conch. Icon., vii, 1852, pl. lxxix, sp. 419, Mch.; Port Essington error—Night I., Q'ld.
44 Hedley.—Rec. Austr. Mus., viii, 1912, p. 154, pl. xlix, figs. 44-45, May 6: Mua I., Torres Strait.

While these three groups may be regarded at present as of subgeneric value only, the Australian group typified by *H. fucata* Pfeiffer[45] must be considered as of generic value, the species being smaller and shorter and having rounded whorls and an open mouth with no constriction. It has a more southern range than the others, and four species may be included, *fucata* Pfeiffer, *conscendens* Cox,[46] *P. mayana* Hedley,[47] and *turneri* Shirley.[48] The genus *Posorites* is proposed, the first-named being the type.

There lives in South Queensland a very curiously coloured shell which Cox named *Bulimus bidwilli.*[49] Hedley referred this to *Papuina*, and, as Pfeiffer had named a shell *Helix bidwilli,* which he also placed in *Papuina*, Hedley renamed Cox's species *Papuina folicola.*[50] A very similar shell lives in New Caledonia, *H. mageni* Gassies, and, if this should prove congeneric (which appears probable), it provides some ground for speculation in connection with zoogeographical problems. In form and colouration these two closely mimic members of the East African genus *Rachis,* so that the generic name *Rachispeculum* is introduced, the type being *Bulimus bidwilli* Cox, that specific name being now revived. The species bears so little resemblance to typical *Papuina* that it need scarcely be differentiated, but it may be noted that it is more elongate, with an entirely different mouth and quite rounded whorls. Almost as peculiar a reference to *Papuina* is the very thin, unicolor, brown shell, with rounded whorls like the preceding, which was described from Yule Island, New Guinea, as *Bulimus macleayi* by Brazier,[51] who reported it as being found in the dry season in crevices of coral rock. According to all other collectors, *Papuina* is essentially a tree-living group, a feature stressed by Hedley in connection with *P. folicola* above noted. Brazier later named an Australian shell *B. beddomei,*[52] but soon discarded it as equivalent to the New Guinea *macleayi.* There are differences, however, and a third form lives near Port Essington.

It may be noted that Kobelt[53] referred the species *macleayi* to *Bothriembryon*, a worse selection than *Papuina,* so the new generic name *Amimopina* is proposed, the Australian *B. beddomei* Brazier being the type.

Genus **Hadra.**

A very large and handsome shell was named *Helix bipartita* by Ferussac,[54] and this was made the type of *Hadra by* Albers.[55] Previously *Thersites* had been introduced by Pfeiffer,[56] and later[57] *H. richmondiana* Reeve[58] was utilised as its type, but the tautonymic type of *Thersites* must be *H. thersites* Broderip. The latter is not an Australian form at all, so *Thersites* must be dismissed from Australian malacological study. Unfortunately Pilsbry[59] used *Thersites* in place

[45] Pfeiffer.—Zeitsch. für Malak., x, 1853, p. 56, Mch.: Wide Bay, Q'ld.
[46] Cox.—Proc. Zool. Soc. (Lond.), 1866, p. 374, Sept. 5: Richmond River, N.S.W.
[47] Hedley.—Rec. Austr. Mus., iii, 1899, p. 151, pl. xxviii, figs. 10-11, Dec. 11: Cooktown, N.Q.
[48] Shirley.—Queensl'd Naturalist, iii, 1921, p. 36, fig. in text, Oct.; National Park, Q'ld.
[49] Cox.—Mon. Austr. Land Shells, p. 72, pl. xiii, fig. 11, 1868: Burnett R., Q'ld.
[50] Hedley.—Nautilus, vii, 1893, p. 73/4, Nov.
[51] Brazier.—Proc. Linn. Soc. N.S.W., i, 1876, p. 108.
[52] Brazier.—Proc. Linn. Soc. N.S.W., i, 1876, p. 127, nom. nud.; iv, 1880, p. 394, May: Torres St.
[53] Kobelt.—Conch. Cab. (Mart and Chemn.), ed. Kuster, Bd. i, Abth. 13, p. 767, *ante* Sept., 1901.
[54] Ferussac.—Hist. Nat. Moll. (1825), pl. 75A, fig. 1; pl. 107A, figs. 1-3.
[55] Albers.—Die Heliceen, 2nd ed. (Martens), 1860, p. 165.
[56] Pfeiffer.—Zeitsch. für Malak., 1855, p. 141.
[57] Martens.—Die Heliceen (Albers), 2nd ed., 1860, p. 157.
[58] Reeve.—Conch. Icon. vii, 1852, pl. lxx, sp. 365, Jan.: Richmond River, N.S.W.
[59] Pilsbry.—Man. Conch. (2), ix, 1894, p. 125.

of *Hadra*, and the usage of such a master has been illegitimately sanctioned without investigation. The true *Hadra* is so unlike the majority of the shells with which the name has been associated that for the present it must be rigidly restricted to close allies of *bipartita* Ferussac, such as *webbi* Pilsbry.[60] In this connection it becomes necessary to fix a type locality for Ferussac's species, and Cooktown seems to be the most likely place. The Cairns shell proves to be *webbi* Pilsbry, and from the Atherton tableland the shells are even more strongly keeled, much less elevated, and apparently a little smaller, and may be distinguished as *Hadra webbi incallida* subsp. nov.

An extraordinary essay on some allies of this species has been published by W. B. Marshall[61] who ignored Pilsbry's *webbi* as a relation, and then introduced many species and subspecies for Torres Straits Island forms. It is somewhat difficult to follow his treatment, as, unacquainted with the collection and variation of the shells, he allows many subspecies from an islet a couple of miles long. An attempt will be made later to reconcile his results with local material, but at first sight it will not be an easy matter.

The beautiful triangular *H. richmondiana* Reeve[62] was wrongly cited as type of *Thersites*, and is therefore here made the type of the new genus *Annakelea*. The shell is very strongly keeled peripherally, and the mouth is contorted a little, and there is no umbilicus showing in the adult, though the immature shell is perforate. Two other species may be included. *H. novaehollandiae* Gray,[63] with its subspecies *H. dupuyana* Pfeiffer,[64] and *H. mitchellae* Cox.[65] This little group is restricted to the northern New South Wales and southern Queensland region coinciding with that of *Hedleyella* as now restricted, while the well known *Pedinogyra* has extended its range a little north but is worthy of note in this connection, these three groups being the largest and most distinctive of Australian snails.

Sphaerospira Morch[66] was introduced for the *Helix fraseri* Gray[67] series, and Fulton,[68] arranging long series of specimens, gave the results as an improvement of the arrangement provided by Pilsbry[69] in his monographic display of the species. Though Pilsbry's association could be amended there is no greater merit in Fulton's. These workers honestly dealt with the material they had available, but I am convinced that no useful classification of Australian land shells can be proposed by extra-limital conchologists however gifted they may be. The varied types of country are unknown to them and they are unfamiliar with local geographical barriers. As one result species are lumped the local range of which demands separation, and on the other hand species have been admitted whose distribution negatives their distinction. Contrary to extra-limital opinion the members of this group have limited ranges and the species and subspecies may be exactly defined when accurately localized series are examined. To particularize,

[60] Pilsbry.—Proc. Nat. Sci. Philad., 1899, p. 473, fig. in text Jan. 11, 1900; Solomon Is. error—Cairns, Q.
[61] Marshall.—Proc. U.S. Nat. Mus., vol. 72, art. 15, 1927, pp. 1-16, pls. 1-8.
[62] Reeve.—Conch. Icon, vii, 1852, pl. lxx, sp. 365, Jan.: Richmond River, N.S.W.
[63] Gray.—Proc. Zool. Soc. (Lond.), 1834, pl. 7, Nov. 25: near River Macquarie, N.S.W.
[64] Pfeiffer.—Conch. Cab. (Chemnitz), ed. Kuster, ii, pl. 124, figs. 15-16: Bellingen R., N.S.W.
[65] Cox.—Cat. Austr. Land Shells, p. 19, 1864: Clarence River, N.S.W.
[66] Morch.—Journ. de Conch., xv, p. 256, July 1, 1867.
[67] Gray.—Proc. Zool. Soc. (Lond.), 1834, p. 64, Nov. 25: New Holland.
[68] Fulton.—Journ. Malac., xi, 1904, pp. 2-11, pl. i, Apl. 25.
[69] Pilsbry.—Man. Conch. (2), ix, 1894, pp. 132-124.

one species only was determined by Fulton thus: *incei*[70] = *challisi*[71] = *appendiculata*[72] = *thatcheri*[73] = *hanni*[74] = *hilli*[75] = *johnstonei*[76] = *bayensis*[77] = *praetermissi*[78] = var. *yeppoonensis*.[79] As here determined, Fulton did not recognize the type of *incei*, but that is of little matter in this connection: *challisi* is in a different group as is *appendiculata*, of which *thatcheri* is a subspecies, and there are other subspecies to be named: *hanni* may be Fulton's *incei*, while *hilli* and *johnstonei* appear to belong to an entirely different series: *bayensis* is very distinct in every detail, and *multifasciata* Cox, which the latter claimed was the same as *bayensis* Brazier, is a different species again: *praetermissi* was described from Cape Direction, and, if it came from there, cannot be classed near the *incei* group, whose range is far south of that point. However, the small groups indicated, but not named by Fulton, are not natural when the species are locally studied; thus *informis*[80] was separated from *frazeri* (sic) into a different group, but at present they appear to be so closely related that they may be merely geographical representatives. Here again subspecies of both *informis* and *fraseri* are recognisable, the type locality of the former being Mackay, Queensland, and of the latter nothing definite was given at its earliest introduction; at present the matter is too complicated to determine, Toowoomba being the most likely place. Moreover, two very different series are represented by *H. oconnellensis* Cox[81] and *H. macleayi* Cox[82] though these were grouped together by Fulton. The former has a flattened base with a wide umbilicus, and the latter is more elevated, the base very rounded, and the umbilicus closed. The presence or absence of an umbilicus is in itself not an essential feature, but becomes of importance when accompanying other characters as in these cases. Thus similar in general structure to *macleayi* Cox are the closely allied *gratiosa* Cox and *etheridgei* Brazier, while to be associated, though more distant, are *croftoni* Cox, *coxi* Crosse, and *blomfieldi* Cox. Subspecies of the last named show an umbilicus not quite closed. For this group the subgeneric name *Bentosites* is proposed, the type being *macleayi* Cox. This species was described from the mainland and Mr. Melbourne Ward collected specimens from Hayman Island, one of the Whitsunday Group, which differ at sight in their much greater elevation and size, and may be distinguished as *Bentosites macleayi wardiana* subsp. nov. The specific name *gratiosa* Cox[83] is preoccupied, so that the new name *Bentosites gavisa* is proposed to replace it, the type locality being Whitsunday Island.

Brazier described *H. etheridgei* from the Andromache River, near Bowen, Queensland, but a MS. note in this collection reads "Hydrometer River not Andromache River" in Brazier's handwriting. A very beautiful little shell closely allied from the Proserpine River, Queensland, is here named *birchi*, a name in the collection. It is smaller than *etheridgei*, and unicolour dark red-brown, with the peristome similarly coloured, not white as in that species. As other workers have reported there are many shells in collections labelled with names by Brazier which have never been published, and these will be legitimised

[70] Pfeiffer.—Proc. Zool. Soc. (Lond.), 1845, p. 126, Feb., 1846: North Austr. (Ince)—Bowen, Q'ld.
[71] Cox.—Proc. Zool. Soc. (Lond.), 1873, p. 565, pl. xlviii, fig. 3, Nov.: L. Island, Broad Sound, Q.
[72] Reeve.—Conch. Icon., vii, pl. cxciii, sp. 1353, Aug, 1854: Australia.
[73] Cox.—Proc. Zool. Soc. (Lond.), 1870, p. 170, pl. xvi, fig. 2, Nov.: Mt. Bersaker, Rockhampton, Q'ld.
[74] Brazier.—Proc. Linn. Soc. N.S.W., i, 1876, p. 97, July: Bowen, Port Denison, Q.
[75] Brazier.—Proc. Zool. Soc. (Lond.), 1875, p. 32, pl. iv, fig. 3, June 1: Mt. Elliott, Townsville, Q.
[76] Brazier.—Proc. Zool. Soc. (Lond.), 1875, p. 32, pl. iv., fig. 2, June 1: Bowen, Q'ld.
[77] Brazier.—Proc. Linn. Soc. N.S.W., i, 1875, p. 2, May: Wide Bay, Q'ld.
[78] Cox.—Mon. Austr. Land Shells, p. 111, add. pl. xx, fig. 13, 1868: Cape Direction, N. Q'ld.
[79] Beddome.—Proc. Linn. Soc. N.S.W., xxii, p. 123, fig. in text, Sept. 17, 1897: Yeppoon, Q'ld.
[80] Mousson.—Journ. de Conch, xvii, p. 54, pl. iv, fig. 3, Jan., 1869: Port Mackay, Q'ld.
[81] Cox.—Proc. Zool. Soc. (Lond.), 1871, p. 55, pl. iii, fig. 4, June 12: O'Connell River, Port Denison, Q.
[82] Cox.—Proc. Zool. Soc. (Lond.), 1864, p. 486, text figs., May 2, 1865: Port Denison, Q'ld.
[83] Cox.—Proc. Zool. Soc. (Lond.), 1871, p. 53, pl. iv, fig. 1, June 12: Whitsunday I., Q'ld.

when available, as in this case. Hedley and Musson described a variety of *H. blomfieldi* Cox from Warro, Queensland, with the name *warroensis*, but it seems to be the typical subspecies from Miriam Vale, and cannot be maintained at present, but there are two subspecies to be named as follows:—A long series from Coolabunia, Kingaroy, shows a consistently broader shell, the upper whorls more rounded and the outer lip dark coloured, not pale as in the typical shell. These were collected by Mr. S. W. Jackson, who noted that the microscopic sculpture was coarser, so that I call them *B. blomfieldi sidneyi* subsp. nov. From the Mary River the shells are much broader still, the breadth exceeding the height, and in some cases leaving the umbilicus uncovered, the outer lip pale. These are named *B. blomfieldi latior* subsp. nov.

The openly umbilicated forms ranging from the very beautiful *H. rainbirdi* Cox to the almost imperforate *H. andersoni* Crosse will later be much split up and many more species and subspecies discovered. The delightful little *H. oconnellensis* Cox is here taken as type of the genus *Varohadra*, and as synonymous of the typical form from the Bowen district may be cited *albofilata* Mousson and *albomarginata* Mousson, names omitted by Fulton. From Finch Hatton, 50 miles west of Mackay, a series of shells was collected by S. W. Jackson, and these are much smaller, more depressed, with the umbilicus less open, and the angulation of the periphery less pronounced; these are named *Varohadra oconnellensis jacksoni* subsp. nov. From Lindeman Island Hedley brought back specimens in which there is less angulation still and the umbilicus is more closed, showing an approach to *H. arthuriana* Cox[84] from L. Island, Broad Sound (not Torres Strait). These may be called *Varohadra oconnellensis caroli* subsp. nov., and it may be that *H. arthuriana* Cox[84] will be regarded later as a subspecies only.

On the other hand we have *H. rockhamptonensis* Cox, which is differently coloured, much more elevated, but which still shows the flattening of the base so pronounced in the true *oconnellensis*. *H. yulei* Forbes is closely related, with a very distinct and beautiful colouration, which is enhanced in the larger subspecies *H. rainbirdi* Cox.

Another series which may be regarded as a subgenus of *Varohadra*, with the name *Figuladra*, is typified by *H. curtisiana* Pfeiffer,[85] which seems to be the species commonly known as *H. lessoni* Pfeiffer, the latter name being anterior. It appears to be the common shell at Port Curtis, and is represented on Boyne Island by a subspecies with a dark lip, not white. This may be named *Varohadra curtisiana exedra* subsp. nov., as it recalls *H. concors* Fulton from Gayndah, Queensland, in that feature. The form, *parsoni* Cox, also from Gayndah (according to its author), has the white outer lip of the true *curtisiana*. Although recently *H. bala* Brazier was reported as synonymous with *curtisiana*, the type locality of the former was originally given as Castle Hill, Townsville, which would make it a representative species. The island representative is *aureedensis* Brazier, which was described from Aureed Island, Torres Strait, an error which was corrected to "about Port Denison," but it lives on the islands off Rockhampton according to the series here. The mainland shell recently known as "*aureedensis*" is a relative of "*lessoni*," but is more elevated, darker coloured, with a broad, pale, circum-umbilical patch. It is here named *Varohadra bernhardi* for Mr. H. Bernhard, of Rockhampton, who has sent me good series and excellent field notes, rendering possible the solution of many problems.

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[84] Cox.—Proc. Zool. Soc. (Lond.), 1873, p. 564, pl. xlviii, fig. 1A, Nov.: L. Island, Q'ld.
[85] Pfeiffer.—Proc. Zool. Soc. (Lond.), 1863, p. 528, Apl. 20, 1864: Port Curtis, Q'ld.

The "*incei*" series is, as the earlier note would suggest, too confused to enable easy discrimination. The names *incei* Reeve, *andersoni* Cox, *tomsoni* Brazier, *hanni* Brazier, *zebina* Brazier, and *challisi* Cox, have all been used indiscriminately. The name *incei* was first published by Philippi with a figure which shows a moderately elevated shell, with a narrow umbilicus, a white lip, and no coloured umbilical patch; as it was collected by Ince the type locality must be Port Denison. The shells from Rockhampton sent by Mr. Bernhard are smaller, much less elevated, with a wider umbilicus, and may be called *Varohadra incei mattea* subsp. nov. *H. andersoni* Cox has the outer lip dark, the umbilicus covered, and a red circum-umbilical patch. As *andersoni* proves to be preoccupied, the species is here renamed *volgiola.* It has been regarded as somewhat variable but the features given are fairly constant. Brazier's *zebina,* separated on account of its microscopic sculpture, may be only a subspecies, while a series from Lindeman Island, Whitsunday Group, collected by Mr. Melbourne Ward, is larger than *andersoni,* with the umbilicus well closed, the outer lip paler and more like *zebina,* but lacking the microscopic sculpture. This subspecies may be called *Varohadra volgiola fortasse* nov. From Hamilton Island in the same group, however, Mr. Ward collected shells similarly coloured above, much more conical in shape, and with the outer lip white, the white columella completely covering the umbilicus and the red umbilical patch absent. This species is here named *Varohadra probleema* nov. The very beautiful shell *H. bellendenkerensis* Brazier[36] has been referred to *Hadra* (s. str.), but is undoubtedly more closely related to the *Sphaerospira* complex, the strong wrinkled sculpture being diagnostic, though the colouration sometimes recalls that of *Hadra.* In the latter the "bipartite" coloration is sometimes missing, the shell becoming unicolor either light or dark. Probably the series *mulgravensis* = *palmensis, meridionalis, rawnsleyi* = *mazee* are relatives of this, and these may represent *Sphaerospira* in North Queensland. The generic name *Gnarosophia* is proposed, with *H. bellendenkerensis* Brazier as type, and the inter-relationship of the above-mentioned species will later be worked out. Although Fulton degraded *H. beddomae* Brazier to varietal rank under *H. bellendenkerensis* Brazier, it may prove to be of subspecific rank when geographical series are studied, as also *Thersites castanea* Odhner. Again, although *meridionalis* Brazier was given varietal rank without question, it is undoubtedly a subspecies, and as the name is preoccupied may be renamed *Gnarosophia palmensis austrina.* Also *mazee* Brazier from Cardwell would be certainly entitled to be considered to be a subspecies of typical *rawnsleyi* Cox from Townsville, the dark outer lip being easily noted. *H. calamus* Brazier, a *nomen nudum,* is an absolute synonym of *H. mazee* Brazier.

As previously noted *H. bayensis* Brazier from Wide Bay is not the same as the shell figured by Cox as a variety of *H. incei* and which he had varietally named *multifasciata,*[37] but is a very distinct species. The Coxian shell belongs to the *whartoni* Cox series, and as the varietal name given is preoccupied it is here renamed *Gnarosophia mitifica,* but a subgenus *Temporena* must be introduced for these thin-shelled, more flattened shells, *whartoni* Cox, being named as type. Arranging the species into groups we are now left with the species named *H. greenhilli* Cox,[38] which ranges alongside none of the preceding, but seems related to *sardalabiata* Cox, of which *H. stephensoniana* Brazier is a synonym. The thin shell, rounded whorls, pale unicolor shade, umbilical characters, and

[36] Brazier.—Proc. Zool. Soc. (Lond.), 1875, p. 32, pl. iv, fig. 4, June 1: Bellendenker Mts., N. Q'ld.
[37] Cox.—Cat. Austr. Land Shells, 1864, p. 9 (Mch.): "Cape York" (Murphy), error.
[38] Cox.—Journ. de Conch., xiv, p. 46, Jan. 1, 1866: Upper Dawson River, Q'ld.

microscopic sculpture disagree altogether with any of the preceding, and necessitate the introduction of a new generic name *Pallidelix, greenhilli* Cox being the type. The other curious looking shell which has been associated here is *H. barneyi* Cox,[89] localised as from "Barney I., Torres Strait," but which lives at Cape Sidmouth, N. Queensland, and recalls in some ways the *dunkiensis* series. The shell is depressedly globose, somewhat tightly coiled, but with a narrow perspective umbilicus and the columella curved, not flattened across the umbilical area. It has no known relations at present and is therefore generically named *Micardista* nov.

Genus **Badistes.**

This generic name was introduced by Gould[90] for a species supposed to be Australian and the chief reason for so proposing the name was given in a note to the effect that the animal looped like a caterpillar instead of gliding like a snail. Later the shell was shown to be an American species so the animal character was transferred to an Australian species, and thus the generic name saved for Australia. However, it is common knowledge that the Australian snail does not loop, yet the name was retained. In face of such persistence it is satisfactory to record that the generic name is invalid so that there can be no more argument in this matter.

There is much difficulty in distinguishing the species and subspecies of the so-called *"Badistes,"* but there are undoubtedly several to be distinguished. The species *H. jervisensis* Quoy and Gaimard[91] is here named as type of the genus *Meridolum*, the various forms and their status being left for further study. Apparently the group is restricted to the same area as *Hedleyella* and *Pedinogyra*, but extending a little further south and even entering Victoria.

In North Queensland a somewhat similar series of shells group around *H. dunkiensis* Forbes, of which a mainland representative has been called *H. nicomede* by Brazier.[92] The resemblance may be only superficial and these have sometimes been placed under *Hadra* and at others under *Thersites, i.e., Sphaerospira*, with both of which they conchologically disagree. At sight they are much more depressed, more lenticular, with a surface sculpture quite different, consisting of elongate granules, and for these the new genus *Spurlingia* is proposed, the type species being *H. nicomede* Brazier. There have been very few actual martyrs in the cause of conchological science so that the name *Spurlingia* will recall the devoted young Spurling who was murdered on Percy Island, Queensland, while shell collecting with Strange. This genus includes *Planispira praehadra* Odhner, which was described as a subfossil from Chillagoe Caves, North Queensland, but which is commonly living in that locality as are all the other species described at the same time as subfossils.

Some of the shells Marshall associated with *bipartita* Ferussac under *Thersites* will naturally associate themselves with the other members of the *dunkiensis* series.

Genus **Rhytida.**[93]

This Neozelanic generic name has been utilized for the reception in Australia of a large series of shells, none of which agree conchologically with the type, *Helix greenwoodi* Gray. Some small shells, which have been doubtfully

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[89] Cox.—Proc. Zool. Soc. (Lond.), 1873, p. 148, pl. xvi, fig. 2, June: "Barney I."—Cape Sidmouth, Q.
[90] Gould.—Otia Conch, 1862, p. 243.
[91] Quoy and Gaimard.—Voy. de l'Astro., Zool., ii, p. 126, pl. x, figs. 18-21, 1832: Jervis Bay, N.S.W.
[92] Brazier.—Proc. Linn. Soc. N.S.W., iii, p. 79, pl. viii, fig. 6, Dec., 1878: Cardwell, Q'ld.
[93] Albers.—Die Heliceen, 2nd ed., 1860, p. 89.

associated, may be disposed of first; such are *Helix splendidula* Pfeiffer,[94] which has been transferred to the Neozelanic genus *Delos,* but it disagrees as much conchologically with that group. The type locality of *Helix splendidula* Pfeiffer was given as East Australia, Torres Straits, but the name was preoccupied by Gmelin, so that the new generic name, *Saladelos,* must be associated with a new specific name, *commixta,* and a definite type locality fixed, as Islands of Torres Straits. Specimens collected by Macgillivray at Lizard Island are larger, more loosely coiled, with a much wider umbilicus, and may be called *S. commixta lacertina* nov. On the other hand specimens from Ben Lomond, Port Denison, are as large as the preceding but with the earlier whorls smaller and the last whorl more produced, making the mouth much larger, while the umbilicus is smaller; this subspecies is called *S. commixta bensa* nov. The New South Wales shell has an elevated spire, large mouth, and medium umbilicus, and for it the name *S. macquariensis* Cox[95] is available.

For some time *Helix strangeoides* Cox[96] has been confused with the preceding, but it is quite different, as in addition to its more regular coiling and narrower deeper umbilicus it is sculptured with close-set spiral lines both above and below, and is therefore made the type of the new genus *Echotrida.* In South Australia the species *H. lincolniensis* Pfeiffer[97] has sometimes been assigned to *Rhytida,* but Cotton and Godfrey have placed it under *Badistes,* an impossible location. The sculpture is distinctive and the shape of the mouth and umbilical features would bring it nearer the Tasmanian Rhytidoids, so the new genus *Cupedora* is introduced for it. The Tasmanian *H. sinclairi* Pfeiffer[98] is a delicate finely sculptured shell, the base sculptured in continuation of the striæ of the upper surface, the spire flattened convex, the umbilicus open, and recalling the Endodontids rather than the present series. The new genus *Tasmaphena* is proposed, and the Tasmanian forms will later be reviewed and allotted to many species and subspecies, as obviously the present species-lumping does not show the facts. From West Australia Quoy and Gaimard described *Helix georgiana*[99] which has sometimes been placed under *Rhytida,* at others under *Flammulina,* while Tryon even made it a *Zonites!* The strongly sculptured base, narrow umbilicus, and produced outer lip differentiate it, the new generic name *Occirhenea* being here given to it.

One of the large shells classed under *Rhytida* was called *confusa* by Pfeiffer, and this name might have been characteristic of the group so much confused have been the species. Certainly the name has been confusedly used as, though it was introduced for a species from Cape Upstart, Queensland, it has been used for a New South Wales form. Cox named *Helix leichardti* from the Leichhardt Collection and afterwards regarded it as the common species at Mount Dryander, Port Denison, Queensland. Reeve had named *Helix ptychomphala* from Port Essington, but the locality was erroneous and should have been Cape Upstart, Queensland. Cox also named *Helix strangei* from Brisbane, Queensland, so there appears to be a series of names available for the species with strongly ribbed upper surface. It seems that there may be more than one genus even in the strongly sculptured forms, as sometimes rather globose and depressed species are found in adjacent localities. For the series of which *H. leichardti* Cox[100] is taken as type the new genus *Strangesta* is proposed, and the species and subspecies will

[94] Pfeiffer.—Proc. Zool. Soc. (Lond.), 1845, p. 128, Feb., 1846: East Austr. near Torres St. (Ince).
[95] Cox.—Proc. Zool. Soc. (Lond.), 1871, p. 645, pl. lii, fig. 7, May 2, 1872: Port Macquarie, N.S.W.
[96] Cox.—Cat. Austr. Land Shells, 1864, p. 20, (Mch.): Moreton Bay, Q'ld.
[97] Pfeiffer.—Proc. Zool. Soc. (Lond.), 1863, p. 527, Apl. 20, 1864: Port Lincoln, South Austr.
[98] Pfeiffer.—Zeitsch. für Malak., 1845, p. 134: Van Dieman's Land.
[99] Quoy and Gaimard.—Voy. de l'Astrol., Zool., ii, p. 129, pl. x, figs. 26-30, 1832: King George's Sound, West Aust.
[100] Cox.—Cat. Austr. Land Shells, 1864, p. 35: Australia (Leichhardt).

be fully developed later. The knowledge of local geography and topography is very necessary for this purpose, as general localities are simply meaningless, and most island forms are restricted and their range on the mainland a doubtful feature. Apparently living alongside these strongly ribbed species is a series of more flattened, more regularly coiled forms, with a fine almost obsolete ribbing, which in general appearance recall the New Caledonian group formerly called *Rhytida* but now called *Ouagapia*. The earliest known was called *Helix franklandiensis* by Forbes, from the Frankland Islands, and a somewhat similar shell from the Richmond River, New South Wales, was named *Helix ramsayi* by Cox. The genus *Murphitella* is proposed, the species *H. franklandiensis* Forbes[101] being type, and the forms *H. beddomei* Brazier and *H. jamesi* Brazier, which have been cited as synonyms, may represent subspecies or even species. Mr. W. W. Froggatt, the veteran entomologist, years ago collected a fine shell resembling the typical *franklandiensis* but with the spire more elevated, the umbilicus narrower, and a fine sculpture of impressed spiral lines. This came from the Cairns district and it was intended at the time to name the species after him so it is here named *M. froggatti* nov. Cox named *Helix namoiensis*[102] from the Upper Namoi River and the shell proves to be a smooth Rhytidoid, more elevated than the typical *Murphitella,* with a narrower umbilicus and larger mouth. For the present it may be regarded as representing a subgenus of *Murphitella,* the new name *Namoitena* being here given to it.

Genus **Chloritis.**

The classification of snails by one feature is always doomed to failure, and this generic name was proposed for a kind of snail with the shell bearing hairs. The original type was also possessed of a distinctive form, but the hair-bearing quality prejudiced superficial students. Then Pilsbry, realising this danger, selected as a dominating character the sculpture of the apex, but again trouble ensues. The typical *Chloritis* has a depressed spire, so Pilsbry introduced *Austrochloritis* for the Australian species, which have a conical spire. The species *Helix porteri* Cox[103] was named as type, but Gude, who investigated this "genus," used *Austro chloritis* to include all Australian species, whether they had elevated or depressed spires. Before investigating the northern forms it may be noted that the southern *Helix victoriae* Cox,[104] which has been classed in *Chloritis* and often referred to on account of its southern range, is quite unlike the typical form. In shell features it agrees with the shells of "*Badistes*" = *Meridolum* ante, but bears hairs. It has a smooth apex, and may be called *Chloritobadistes* nov. gen. to indicate its form.

Two rare species which have never been previously located may be treated first. Pfeiffer described *Helix banneri*[105] and, through autoptic unacquaintance, the species has been allotted to the *Hadra* complex, with which at first sight it shows no relationship, being thin and with a different coiling, and the presence of hair scars suggests its alliance with the "*Chloritis*" assemblage. The shell called *Chloritis coxeni* Cox is very like it in miniature, but is a true "Chloritid," having a "*Chloritis*" apex like the species of that group. *H. banneri* does not show any sculpture on the apex, and as this has been regarded as an essential feature the new generic name *Chloritisanax* is introduced for *H. banneri* Pfeiffer alone.

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[101] Forbes.—Voy. Rattlesnake, ii, app. p. 372, 379, pl. ii, fig. 7AB, Jan., 1852: Frankland I., N. Q'ld.
[102] Cox.—Mon. Aust. Land Shells, 1868, p. 29, pl. xviii, fig. 10: Namoi River, N.S.W.
[103] Cox.—Proc. Zool. Soc. (Lond.), 1866, p. 378, Sept. 5: Upper Clarence River, N.S.W.
[104] Cox.—Mon. Austr. Land Shells, 1868, p. 37, pl. xii, fig. 5: Western Port, Victoria.
[105] Pfeiffer.—Proc. Zool. Soc. (Lond.), 1862, p. 270, Apl. 20, 1863: Cape Direction, N. Q'ld.

Cox named *Helix dryanderensis,*[106] and, though no illustration has yet appeared, a good description was offered. The type proves to be a semi-uncoiled planate shell with large hair scars, and had been covered with mud, apparently by the animal itself. The mouth is free and decurved, and therefore it correlates with no *"Chloritis"* group. The new generic name *Offachloritis* is proposed for it.

Hedley described *Chloritis jacksoni,*[107] obviously not congeneric with species of *Austrochloritis* which were figured alongside. The only common conchological feature is the hair-bearing quality, and against this is the flattened shape, umbilical character, the thinness and lack of lip reflection, and therefore it is generally distinguished as *Tolgachloritis* nov. At the same time Hedley introduced *Chloritis inflecta,*[108] which was just as unlike, being small, globose, thick, with reflected lip and closed umbilicus, and this must also be generically differentiated as *Obsteugenia* nov.

The finest "Chloritid" shells in Australia are those associated with *H. coxeni* Cox, which has been already mentioned. These show the true "*Chloritis,*" apex, and have a very fine hairy surface, but are subglobose, with an elevated spire, an open almost circular mouth, a broadly reflected columella, though the outer lip is only slightly reflected, and a narrow deep umbilicus. The shell is very thin and the periphery very rounded. This genus is named *Gloreugenia* nov., the species *H. coxeni* Cox[109] being named as type.

The West Australian shell Gude called *Chloritis micromphala*[110] seems more related to the other West Australian shells, of which it might prove only a hair-bearing representative. Examination does not reveal any hairs, however, and to my surprise I found that Gude noted their absence, so that it cannot be classed as *"Chloritis"* at all, and is therefore named *Kimboraga* nov. gen.

Desert Snails.

The Horn Expedition brought back a series of small snails which were described by Tate[111] under the generic name *Hadra*, a most extraordinary location. Hedley[112] reported upon the anatomy of some of these and found two broad types of animal features, and, ignoring shell-character entirely, placed the species under the names *Xanthomelon* and *Thersites,* previously regarded as sections only of *Hadra.* Such arrangement has never been reviewed, though the conchological features demanded re-investigation. It may be observed that *Xanthomelon* was introduced for a large globose solid shell, and *Thersites* was then being used for the larger, solid, triangular species, *H. richmondiana.*

Desert species assigned to these groups were small, flattened and keeled or rounded as well as small globose forms, but never anything like the types named. Consequently the usage of such names tended to mislead students and certainly mystify them, especially as, if the same kind of shell ranged into North-west Australia, it was placed under *Rhagada, e.g., Helix fodinalis* Tate and *angasiana* Pfr. in Hedley's West Australian List.

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106 Cox.—Proc. Zool. Soc. (Lond.), 1872, p. 19, June: Mt. Dryander, Port Denison, Q'ld.
107 Hedley.—Proc. Linn. Soc. N.S.W., xxxvii, p. 256, pl. v., figs. 13-16, Dec. 13, 1912: Near Cairns, N. Q'ld.
108 Hedley.—Proc. Linn. Soc. N.S.W., xxxvii, p. 256, pl. iv, figs. 9-11, pl. v, fig. 12, Dec. 13, 1912: Tinaroo, N. Q'ld.
109 Cox.—Proc. Zool. Soc. (Lond.), 1871, p. 54, pl. iii, fig. 12, June 12: Whitsunday I., N. Q'ld.
110 Gude.—Proc. Mal. Soc. (Lond.), vii, p. 281, pl. xxi, fig. 6, Apl. 8: Barrier Range, N.W. Austr.
111 Tate.—Trans. Roy. Soc. South Austr., xviii, pp. 192-3, Nov., 1894.
112 Hedley.—Rep. Horn Sci. Exped., Zool., ii, pp. 220-226, Feb., 1896.

Tate, who was a great conchologist, remarked upon the discrepancies, while using Hedley's classing, in the Horn Report, and his observations are good. Why desert influence should modify shells in many different directions, so that they conchologically resemble wet country types but have no relation, is a problem for the future student. How this variation can be carried out without affecting the inhabitant may then be studied. One of our great malacologists would allow shell convergence in some groups, but deny it in others, the circumstances being identical, so there may be another puzzle. In view of such perplexing conditions it seems best to group these Desert Snails conchologically until much more is known of animal characters. Thus *Angasella* was introduced years ago for one of these Desert Snails, and the group, though the name to be used is *Pleuroxia,* can be recognised. Then Pilsbry added *Glyptorhagada* for the beautiful shell called *Helix silveri* by Angas and that group can also be used. Hedley at one time refused acceptance of these, determining all the species as either *Thersites* or *Xanthomelon,* and thus he introduced *Xanthomelon asperrimum,*[113] an exquisite, flattened, strongly keeled, heavily sculptured shell with a narrow open umbilicus. This may be placed alongside *silveri,* but a new subgeneric name *Eximiorhagada* is needed. On the other hand a species recalling *silveri* has been described from Kangaroo Island as *Helix bordaensis* by Angas.[114] The mouth is open in all the specimens seen, and there is a notable anteperipheral ditch which separates it, and a new subgeneric name *Halmatorhagada* is introduced for this species, *tomsetti* Tate being placed with it. Another strongly keeled shell was named *Thersites hillieri* by Smith,[115] but it does not show the grained sculpture of *Eximiorhagada* and has a broad umbilicus indicating that the keeling is due to convergence only. A new generic name *Divellomelon* is proposed for this species.

The most curious allotment to *Hadra* was *wattii* Tate,[116] a small, flattened subdiscoidal, many-whorled, minutely but openly umbilicated shell. In no feature does it conchologically resemble the types of *Hadra, Xanthomelon* or *Thersites* auct., so it is made the type of the new genus *Vidumelon*. Another extraordinary shell is that named *Hadra grandituberculata* by Tate;[117] the tuberculation is somewhat peculiar but more distinctive is the complete aperture, almost free, and the elevated spire with rounded whorls and deep sutures. Though assigned to *Xanthomelon* by Hedley its relations to the rest of the Centralian shells are somewhat obscure; the new generic name *Granulomelon* is therefore introduced for it.

A very curious matter which needs consideration is the occurrence throughout Central Australia of species conchologically resembling North Queensland coastal shells. While the preceding species do not resemble *Xanthomelon,* there is a series of globose shells which conchologically do recall that form, and for these I have already proposed *Sinumelon.* Again Hedley described *Thersites basedowi,*[118] which recalls the *Trachiopsis* series, but which is nothing like any shell of the "*Thersites*" association. Three forms resemble each other in general conchological features but one has the apex granulated while another bears hairs; the hair-bearing one has the apex smooth so that it is difficult to assess the value of the differences in terms used in connection with other groups. Therefore the generic name *Semotrachia* is proposed for *T. basedowi* Hedley, and the subgeneric name

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[113] Hedley.—Trans. Roy. Soc. South Austr., xxix, p. 164, fig. on text, 1905: Mann Range, Central Aus.
[114] Angas.—Proc. Zool. Soc. (Lond.), 1880, p. 419, pl. xl, fig. 3, Oct. 1: Kangaroo I., South Austr.
[115] Smith.—Proc. Mal. Soc. (Lond.), ix, p. 26, fig., Mch. 31, 1910: South Central Austr.
[116] Tate.—Trans. Roy. Soc. South Austr., xviii, p. 192, Nov., 1894: Central Australia.
[117] Tate.—Trans. Roy. Soc. South Austr., xviii, p. 193, Nov., 1894: Central Australia.
[118] Hedley.—Trans. Roy. Soc. South Austr., xxix, p. 161, pl. xxx, figs. 1-3, 1905: Musgrave Ranges, Central Austr.

Catellotrachia for the smaller shell *Hadra winneckeana* Tate[119] with the granulose apex, and the subgeneric name *Spernachloritis* for *Hadra setigera* Tate,[120] the species showing hairs and having a smooth apex.

Since the above was written Cotton and Godfrey[121] have proposed *Notobadistes*, naming *Helix bitaeniata* Cox as type. That species is undoubtedly congeneric with my prior *Sinumelon* (type *H. nullaborica* Tate, which they include in their group), and the specific name is *flindersi* A. Adams and Angas, published five years earlier than Cox's name. They still allow *angasiana* Pfeiffer, but that name was preoccupied, so that I rename it *Sinumelon godfreyi*, as a mark of appreciation of the work of Mr. F. K. Godfrey in connection with South Australian shells.

Cotton and Godfrey place under *Badistes* the species *patruelis* A. Adams and Angas while under *Notobadistes* they place *loriolianus* Crosse, *rufofasciatus* Brazier and *subloriolianus* Pilsbry. The last two were regarded as synonymous by Hedley and these three or four form a very distinct group which is here given the new generic name *Meracomelon*, *rufofasciata* Brazier[122] being selected as type.

The species *H. bednalli* Brazier[123] has even been classed as a form of *jervisensis*, though geographically it is divorced through the intervention of *H. victoriae* Cox. The former does not show any hair-scars or it might be placed with the latter. The correct name appears to be *sutilosa* Deshayes,[124] and to keep the form under notice it may be located in *Meridolum* with the new subgeneric name *Exilibadistes*.

Genus **Rhagada**.[125]

This generic name was proposed for the West Australian *Helix reinga* Gray[126] which is now identified with *torulus* Ferussac.[127] Many Westralian shells group around this, and *Rhagada* has been used loosely, but subgenera may be differentiated. Thus *H. sykesi* Smith[128] is elevated, many-whorled, with fairly open mouth, the columella bearing a prominent tooth and appressed, practically closing the umbilicus: the name *Amplirhagada* is here introduced with *sykesi* as type. *H. plectilis* Benson[129] is very rudely sculptured, the shell more globose, the mouth larger and open, and, while the columella is reflected, it is not appressed to the body-whorl; it may be cited as type of *Plectorhagada*, a new subgeneric name. Another subgeneric name, *Globorhagada*, is proposed for *prudhoensis* Smith,[130] which is large and globose, with open circular mouth, the columella thickened, much reflected and appressed but not closing the umbilicus, a thick glaze joining the inner and outer lips.

So-called Endodonts.

Two or three different families are confused under the general family name Endodontidae in Australia. Hedley's last conchological essay[131] dealt with some species when he introduced *Gyrocochlea* and *Rhophodon*, but also introduced the

[119] Tate.—Trans. Roy. Soc. South Austr., xviii, p. 194, Nov., 1894: Centralia.
[120] Tate.—Trans. Roy. Soc. South Austr., xviii, p. 194, Nov., 1894: Centralia.
[121] Cotton and Godfrey.—South Aust. Naturalist, xiii, Aug., 1932, pp. 169-170.
[122] Brazier.—Proc. Linn. Soc. N.S.W., i, p. 17, May, 1875: Yardea, 360 miles N. of Adelaide, S.A.
[123] Brazier.—Proc. Zool. Soc. (Lond.), 1871, p. 641, May 2, 1872: Near Adelaide, S.A.
[124] Deshayes.—Hist. Nat. Moll. Terr. (Ferussac), i, p. 203, *ante* 1850, pl. 17A, figs. 8-19: Ile St. Pierre, S.A.
[125] Albers.—Die Heliceen, 2nd ed., 1860, p. 108.
[126] Gray in Pfeiffer.—Symb. Helic., iii, 1846, 73: New Zealand, error—West Austr.
[127] Ferussac.—Hist. Nat. Moll. Terr., Tabl. Lim., 1821, 34, pl. xxvii, figs. 3-4: New Holland (Peron).
[128] Smith.—Proc. Mal. Soc. (Lond.), i, p. 92, pl. 7. fig. 8, June, 1894: Parry I., N.W.A.
[129] Benson.—Ann. Mag. Nat. Hist. (2), xi, p. 29, Jan. 1853: Sharks Bay, West Aust.
[130] Smith.—Proc. Mal. Soc. (Lond.), i, p. 91, pl. 7, fig. 9, June, 1894: Prudhoe I., N.W.A.
[131] Hedley.—Austr. Zool., iii, pp. 215-221, May 9, 1924.

generic Neozelanic name *Suteria* for a new species *seticostata*. Instead of the last named the new generic name *Setomedea* is introduced, the species *seticostata*[132] being taken as type. Many years ago Suter reported that the Tasmanian snailfauna appeared to be very closely related to that of New Zealand, judging from examination of the radular characters. His conclusions have not been accepted by Australian malacologists on account of the discrepant shell characters. Mollendorff and others have noted that two or three families must be separated, yet the species have here been regarded as congeneric. As a beginning, a few easily recognizable groups may be named as the following groupings will prove necessary. *Helix jungermanniae* Petterd[133] was allotted to *Flammulina* by Suter, and the last location by May was in *Laoma,* another Neozelanic group more familiar to Suter than to May; the generic name *Pasmaditta* is here introduced. Another shell located by May in *Laoma* was the curious sinistral *H. weldii* Ten, Woods,[134] which lacks the mouth armament of the Neozelanic type, and is here made the type of the genus *Miselaoma.* Another species regarded by May as *Flammulina* was the *Helix fordei* Brazier,[135] which Suter had referred to *Thalassohelix*; the Tasmanian shell is made the type of the genus *Mulathena.*

Pedicamista is proposed for *H. caesus* Cox,[136] which was also placed by May in *Laoma,* though Suter had assigned it to *Phrixgnathus,* from the type of which it differs as much as from the typical *Laoma.* A remarkable little shell is the *Helix minima* Cox,[137] with a wide open umbilicus very unlike that of *Laoma,* under which genus it has been placed. The generic name *Laomavix* is proposed, and, as Cox's specific name is invalid, the species will be known as *Laomavix collisi* Brazier.[138]

The unarmed species of Endodontidae were classed as *Charopa*, the Neozelanic *coma* Gray being the type, and Suter regarded *Helix antialba* Beddome[139] as there referable, but it disagrees conchologically and is representative of an Australian series, so that it may be regarded as type of the new genus *Geminoropa.* *H. albanensis* Cox[140] has more the appearance of a Charopid form, but Suter classed it under *Gerontia,* a generic name later displaced by the earlier *Flammulina,* which is now regarded as of family distinction. The generic name *Pernagera* is therefore introduced for *albanensis.*

Brazier's *Helix dispar*[141] is so different superficially, especially in showing a basal tooth, that it must be separated as *Dentherona;* at present it stands alone. A very easily recognizable group is that about *H. sericatula* Pfeiffer[142] with its almost obsolete umbilicus and its fine sculpture, so that *Elsothera* is here introduced; *inusta* Cox and *funerea* Cox appear congeneric. The Tasmanian *Helix savesi* Petterd[143] was regarded as *Phacussa* by Suter, but relegated to *Flammulina* by May, with which genus it cannot be associated, so that *Stenacapha* is here added for it.

As a bad refuge for some Endodontid forms whose apical sculpture was very notable, being lirate concentrically, Cox and Hedley selected the Neozelanic genus

[132] Hedley.—Austr. Zool., iii, p. 221, pl. xxxii, figs. 41-44, May 9, 1924: Dorrigo, N.S.W.
[133] Petterd.—Mon. Land Shells Tasm., p. 17, Apl., 1879: Launceston, Tasmania.
[134] Tenison-Woods.—Proc. Roy. Soc. Tasm., 1876, p. 160, Feb. 27, 1877: Stanley, N. Tasm.
[135] Brazier.—Proc. Zool. Soc. (Lond.), 1870, p. 662, May, 1871: Mt. Wellington, Tasm.
[136] Cox-Legrand.—Coll. Mon. Land Shells, Tasm., 1st ed., p. 3, June, 1871: Recherche Bay, S. Tasm.
[137] Cox.—Mon. Aust. Land Shells, p. 10, pl. xii, fig. 8, 1868: Mt. Wellington, Tasm.
[138] Brazier.—Proc. Roy. Soc. Tasm., 1876, p. 168, Feb. 27, 1877.
[139] Beddome-Petterd.—Mon. Land Shells Tasm., p. 41, Apl., 1879: Gads Hill, N. Tasm.
[140] Cox.—Proc. Zool. Soc. (Lond.), 1867, p. 723, Apl. 3, 1868: Pt. Albany, West. Austr.
[141] Brazier.—Proc. Zool. Soc. (Lond.), 1870, p. 661, May, 1871: Mt. Wellington, Tasm.
[142] Pfeiffer.—Proc. Zool. Soc. (Lond.), 1849, p. 127, 1850: Port Jackson, N.S.W.
[143] Petterd.—Mon. Land Shells Tasm., p. 12, Apl. 1879: Table Cape, N. Tasm.

Allodiscus. Gabriel has followed, so that revision is demanded, and *Helix otwayensis* Petterd[144] is made the type of the genus *Oreomava,* the Tasmanian species, *alpina* Johnston[145] being renamed *Oreomava johnstoni,* the name *alpina* being preoccupied. A very dissimilar shell is *Flammulina meraca* Cox and Hedley,[146] and this is named *Pillomena;* a second species may be *Helix subdepressa* Brazier,[147] but, as that name is preoccupied, it will be known as *Pillomena dandenongensis* Petterd, a recognised synonym. A somewhat "Charopid" appearance is shown by the North Queensland *Helix spaldingi* Brazier,[148] but Hedley placed it under *Flammulina,* with which it conchologically disagrees in every detail. The generic name *Torresiropa* is introduced for it, and the new name *Torresiropa mella* is proposed for the species named var. *carinata* Brazier,[149] which name is invalid.

Another curious shell was named *Helix* (*Thalassia*) *gayndahensis* by Brazier,[150] and Hedley classed it under *Flammulina,* suggesting that it might be added to *Hedleyoconcha* as a second species. It does not recall the last-named group, and it is very surely not a *Flammulina* conchologically, and the fact that Brazier placed it in *Thalassia* indicates its distinction. Its texture is different from any of the above, and the quaint keeling and rounded base make it generically separable as *Delinitesta* gen. nov.

The Tasmanian *diemenensis* Cox[151] recalls the Rhytidoid series and little resembles true *Flammulina,* under which it was placed by May, so that the new generic name *Thryasona* is introduced for it.

Pfeiffer described a small shell as *Helix lizardensis*[152] and it appears to have been sadly neglected. Pilsbry, probably from its rarity, allowed it an undefined place in his family Endodontidae, but it has no resemblance to any Australian "Endodont" in the vaguest sense of that term. It suggests rather the Trochomorphas of the Pacific and is here made the type of a new genus *Theskelomensor.* The shell is small, lenticular, sharply keeled, many-whorled narrowly, but deeply umbilicated. The apical whorls are smooth, while a very distinctive antiperipheral groove is present, guarded by a ridge parallel to the keel. Odhner has introduced a *Flammulina cumulus*[153] from Bellender Ker Mountain (4,000 ft.) placing it in the family Endodontidae, and then has used the genus in connection with zoogeographical suggestions. As the species is certainly not conchologically referable to the genus *Flammulina,* the new genus *Oreokera* is proposed for it. It appears to belong to the family Endodontidae in the widest sense, but, of course, *Flammulina* itself does not belong to that association. It is somewhat unfortunate that the New Guinea species mentioned as belonging to *Flammulina, abdita* Hedley,[154] is also not referable to that genus nor even to the same family.

Genus **Planispira.**

No typical species occurs in Australia but some species have been referred here, though Pilsbry[155] wisely introduced *Trachiopsis* for the *tuckeri* series. The larger form known as *delessertiana* appears to need separation, as from Chillagoe

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144 Petterd.—Mon. Land Shells Tasm., p. 39, Apl., 1879: Cape Otway, Victoria.
145 Johnston-Petterd.—Mon. Land Shells Tasm., p. 39, Apl., 1879: Surrey Hills, N. Tasm.
146 Cox and Hedley.—Mem. Nat. Mus. Melb., No. 4, Feb. 1912, p. 13, p. 12, pl. iv, figs. 19-21: Dandenong Range, Vic.
147 Brazier.—Proc. Zool. Soc. (Lond.), 1871, p. 641, May 2, 1872: Snowy River, Vic.
148 Brazier.—Proc. Linn. Soc. N.S.W., i, p. 103, 1876: Cape York, N. Q'ld.
149 Brazier.—Proc. Linn. Soc. N.S.W., i., p. 103, 1876: Thursday I., Torres St.
150 Brazier.—Proc. Lenn. Soc. N.S.W., i, p. 2, May, 1875: Gayndah, S. Q'ld.
151 Cox.—Mon. Aust. Land Shells, p. 20, pl. 7, fig. 6, 1868.
152 Pfeiffer.—Proc. Zool. Soc. (Lond.), 1862, p. 269, Apl. 10, 1863: Lizard I., N. Austr.
153 Odhner.—Kungl. Svensk. Vetenskap. Handl., Bd. 52, No. 16, p. 84, pl. 3, figs. 89-91, Sept. 19, 1917: Bellendenker Mt., Q'ld.
154 Hedley.—Rec. Austr. Mus., iii, p. 47, Aug. 5, 1897: Brit. New Guinea.
155 Pilsbry.—Man. Conch. (2), viii, p. 284, 1892.

district Mr. W. D. Campbell sent many specimens of apparently new species representing each series, and these were very distinct. Thus the true *Trachiopsis* was represented by a larger keeled shell, lacking the fine sculpture and with continuous mouth, while the *delessertiana* series was replaced by a still larger almost globose species. In West Australia the species *froggatti* Ancey[156] and *monogramma* Ancey resemble the keeled *Trachiopsis*-like shell, but the mouth is distinctly not continuous, so that the generic name *Westraltrachia* is here proposed, the species *froggatti* being selected as type. The correct name for *delessertiana* appears to be *torresiana* Hombron and Jacquinot, and the larger form may be specifically separable, in which case its name would be *leucolena* Crosse,[157] a later name being *endeavourensis* Brazier.[158] The generic name *Torresitrachia* is here proposed, the large form *endeavourensis* being the type.

Smith[159] described two small shells from Baudin Island, North-west Australia, placing them under *Gonostoma*. Transferred to the *Trachiopsis* section of *Planispira* by Pilsbry, they cannot remain there, as neither agree with the *tuckeri* form. The first species, *baudinensis*, has strong sculpture, and a peculiar aperture, and is made the type of the new genus *Gonobaudinia*, while the second *H. collingii*, though the apertural features are somewhat similar to those of the preceding, is covered with "*Chloritis*" hairs and is certainly not congeneric, so may be called *Setobaudinia*; perhaps both are more nearly related to extralimital groups.

At the end of his Monograph published in 1868 Cox added two new species *Helix wesselensis* and *H. creedi*, from the north-eastern extremity of Arnhem Land. These are very interesting as they prove to be quite unlike known East Australian forms. *H. creedi* is here made the type of the new genus *Arnemelassa*, which may be related to *Rhagada* sensu lato, and perhaps *H. forrestiana* Angas may be an ally. This Hedley put under *Albersia*, a genus which it does not much resemble. The other species, *H. wesselensis*, agrees generally with the type of *Cristigibba* Tapparone-Canefri, and may be placed here as indicating the source of these Northern Territory shells, but a new subgenus *Australgibba* is introduced too. Under *Planispira* Hedley placed the interesting shell Cox named *Helix leucocheilus*,[160] describing from near Cairns, North Queensland a variety *pusilla*, the type locality of *leucocheilus* being the Clarence River, N.S. Wales. Pilsbry located it under *Hadra*, proposing a variety *lismorensis*, while this variety had been described by Cox and Brazier as *bellingerensis* independently. The shell suggests *Chloritis* in some respects, but the keel is foreign to that group, and, while the apertural features suggest *Trachiopsis*, the curious thickening of the mouth is unmatched in either. The new generic name *Ventopelita* is proposed, *leucocheilus* Cox being named as type, but Cox's first name *mariae*[161] must be revived as it is not preoccupied.

Genus **Sitala**.

A series of Australian shells has been referred to *Sitala*, and this association has been questioned by malacologists such as Mollendorff. Odhner has given some anatomical details which confirm the relationship with *Sitala*, but also subgeneric segregation. For these Australian species the name *Turrisitala* is

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156 Ancey.—Proc. Linn. Soc. N.S.W., xxii, p. 774, pl. 36, fig. 2, June 4, 1898: Oscar Range, N.W.A.
157 Crosse.—Journ. de Conch., xv, p. 447, Oct. 1, 1867: "Fiji" error—North Austr.
158 Brazier.—Proc. Zool. Soc. (Lond.), 1871, p. 640, May 2, 1872: Endeavour R., N. Q'ld.
159 Smith.—The Conchologist, ii, pp. 97-98, Mch. 25, 1983: Baudin I., N.W. Austr.
160 Cox.—Mon. Aust. Land Shells, p. 54, pl. viii, figs. 7-7AB, 1868.
161 Cox.—Proc. Zool. Soc. (Lond.), 1864, p. 594, May 2, 1865: Clarence River, N.S.W.

therefore introduced, the somewhat elevated *Helix turriculata* Cox[162] being named as type, but as Cox's name is preoccupied the species must be called *Turrisitala normalis*.

Genus **Microcystis.**

The non-recognition of this genus in Australia was long ago urged, and Smith placed the West Australian shell in *Lamprocystis*. *Thalassia* had been proposed for *Helix subrugata* Pfeiffer, but as it was invalid Gude introduced *Nitor*.[163] This group is well defined by texture and the glassy forms must be anatomically examined for accurate classification. A good guide is their habitat, and when this is associated with apparently slight characters these demand recognition. Thus Hedley described *Microcystis inscensa*,[164] writing, "This species is distinguished from Australian co-generic forms by being more globose." He then added that the collector had found it "climbing the trunks of trees," whereas generally "*Microcystis*" lives under fallen leaves on the ground." The generic name *Dendronitor* is here proposed for the species *M. inscensa* Hedley, which differs in size, elevation, texture, and umbilical features from the type of *Nitor*.

The West Australian shell Smith named *Lamprocystis lissa*[165] has been transferred to *Microcystis* by Hedley, but it is not much like *Nitor*, the East Australian representative, and therefore may be called *Westracystis* until its anatomy is studied.

Odhner has given some anatomical details of some Queensland "*Microcystis*," including *marmorata* Cox (the correct name being *circumcincta* Cox), which has many more teeth in the radular rows than *rustica* Cox (the authority should be Pfeiffer) also allows *Thalassia* (*i.e. Nitor*) for *pudibunda* Cox. Odhner[166] then introduced *Macrochlamys*, an Indian genus, into the Australian fauna for a new species *M. suturalis*, giving both anatomical and shell characters of the species. In view of this good description it is better to propose the new generic name *Malandena* for the Australian species rather than allow the vague term *Macrochlamys*, which Godwin-Austen has much restricted in usage in connection with Indian molluscs.

Genus **Diplommatina.**

The species classed under *Diplommatina* were monographed by Kobelt, who, however, was unfamiliar with the Australian species, and consequently located them without serious consideration. Thus, the peculiar form named *D. gowllandi* by Brazier[167] was placed under *Pseudopalaina*, with the type of which it disagrees in many features. It is here named *Eclogarinia*. Hedley suggested that the species he named *D. egregia*[168] might go under *Arinia*, and Kobelt so placed it, though it is very unlike the type of that group. The name *Famarinia* is here proposed for it.

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[162] Cox.—Mon. Aust. Land Shells, p. 8, pl. viii, fig. 11, 1868: Port Curtis, Q'ld.
[163] Gude.—Proc. Mal. Soc. (Lond.), ix, p. 270, Mch. 30, 1911.
[164] Hedley.—Proc, Linn. Soc. N.S.W., xxxvii, p. 262, pl. vii, figs. 39-40; pl. viii, fig. 41, Dec, 13, 1912: Coolabunia, Q'ld.
[165] Smith.—Proc. Mal. Soc. (Lond.), i, p. 86, pl. vii, figs. 22-23, Jan., 1894: North West Austr.
[166] Odhner.—Kungl. Svensk. Vetenskap. Handl., Bd. 52, No. 16, p. 81, pl. 3, figs. 86-88, Sept. 19, 1917: Bellendenker Mt., Q'ld.
[167] Brazier.—Proc. Zool. Soc. (Lond.), 1874, p. 670, pl. 83, figs. 19-21, Apl. 1, 1875: Fitzroy I., N. Q'ld.
[168] Hedley and Musson.—Proc. Linn. Soc. N.S.W. (2), vi, p. 561, text fig. 8, May 23, 1891: Calliungal, Q'ld.

Genus **Georissa.**

Brazier named *Georissa multilirata*,[169] and through the erroneous location Odhner[170] did not recognise the species, and therefore renamed it *Omphalotropis minuta*. It, however, seems more like the former than the latter, and as it is conchologically neither, the new name *Omphalorissa* is introduced for it.

Genus **Ditropis.**

Australian Cyclophorids are few and rare, so that when they were found they were allotted to extra limital groups without careful criticism. The species *C. macleayi* Brazier[171] was referred to *Ditropis*, and Hedley suggested *Ditropopsis*, but remarked that the operculum differed. As that is an essential feature, the new name *Ditropisena* is here proposed. In the same manner Cox reported that the opercular characters of *Callia splendens* Dohrn[172] were not those of *Callia*, now *Callianella*, so that a new name *Suavocallia* is introduced for our species.

The new names are listed herewith for easy reference:—

Fastosarion subgen. nov.: type *Vitrina superba* Cox.
Vercularion subgen. nov.: type *Helicarion bullacea* Odhner.
Luinarion subgen, nov.: type *Helicarion thomsoni* Ancey.
Hedleyella falconeri jacksoniana subsp. nov.
Hedleyella falconeri imitator subsp. nov.
Pygmipanda gen. nov.: type *Bulimus atomatus* Gray.
Brazieresta gen. nov.: type *Bulimus larreyi* Brazier.
Pandofella gen. nov.: type *Panda whitei* Hedley.
Victaphanta subgen. nov.: type *Nanina atramentaria* Shuttleworth.
Melavitrina gen. nov.: type *Vitrina milligani* Pfeiffer.
Prolesophanta gen. nov.: type *Helix dyeri* Petterd.
Tasmanembryon subgen. nov.: type *Bulimus tasmanicus* Pfeiffer.
Hartogembryon subgen. nov.: type *Bulimus onslowi* Cox.
Larapintembryon subgen. nov.: type *Liparus spenceri* Tate.
Satagembryon subgen. nov.: type *Buliminus gratwicki* Cox.
Papuexul subgen. nov.: type, *Helix bidwilli* Pfeiffer (em).
Noctepuna subgen. nov.: type *Helix poiretiana* Reeve.
Posorites gen. nov.: type *Helix fucata* Pfeiffer.
Rachispeculum gen. nov.: type *Bulimus bidwilli* Cox.
Amimopina gen. nov.: type *Bulimus beddomei* Brazier.
Hadra webbi incallida subsp. nov.
Annakelea gen. nov.: type *Helix richmondiana* Reeve.
Bentosites gen. nov.: type *Helix macleayi* Cox.
Bentosites macleayi wardiana subsp. nov.
Bentosites gaviso nom. nov. for *Helix gratiosa* Cox.
Bentosites birchi sp. nov.
Bentosites blomfieldi sidneyi subsp. nov.
Bentosites blomfieldi latior subsp. nov.
Varohadra gen. nov.: type *Helix oconnellensis* Cox.
Varohadra oconnellensis jacksoni subsp. nov.
Varohadra oconnellensis caroli subsp. nov.

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169 Brazier.—Proc. Zool. Soc. (Lond.), 1874, p. 670, pl. 83, figs. 8-10, Apl. 1, 1875: Fitzroy I., N. Q'ld
170 Odhner.—Kungl. Svensk. Vetenskap. Handl., Bd. 52, No. 16, p. 99, pl. 3, figs, 113-114, Sept. 19, 1917: Chillagoe Caves, Q'ld.
171 Brazier.—Proc. Linn. Soc. N.S.W., ii, 122, July, 1877.
172 Dohrn.—Proc. Zool. Soc. (Lond.), 1862, p. 183, Sept.: Lizard I., N. Q'ld.

Figuladra subgen. nov.: type *H. curtisiana* Pfeiffer.
Varohadra curtisiana exedra subsp. nov.
Varohadra bernhardi sp. nov.
Varohadra incei mattea subsp. nov.
Varohadra volgiola nom. nov. for *Helix andersoni* Cox.
Varohadra volgiola fortasse subsp. nov.
Varohadra probleema sp. nov.
Gnarosophia gen. nov.: type *Helix bellendenkerensis* Brazier.
Gnarosophia palmensis austrina nom. nov. for *H. meridionalis* Brazier.
Gnarosophia mitifica nom. nov. for *H. incei* var. *multifasciata* Cox.
Temporena subgen. nov.: type *Helix whartoni* Cox.
Pallidelix gen. nov.: type *Helix greenhilli* Cox.
Micardista gen. nov.: type *Helix barneyi* Cox.
Meridolum gen. nov.: type *Helix jervisensis* Quoy and Gaimard.
Spurlingia gen. nov.: type *Helix nicomede* Brazier.
Saladelos gen. nov.: type *Helix splendidula* Pfeiffer.
Saladelos commixta nom. nov. for *Helix splendidula* Pfeiffer.
Saladelos commixta lacertina subsp. nov.
Saladelos commixta bensa subsp. nov.
Echotrida gen. nov.: type *Helix strangeoides* Cox.
Cupedora gen. nov.: type *Helix lincolniensis* Pfeiffer.
Tasmaphena gen. nov.: type *Helix sinclairi* Pfeiffer.
Occirhenea gen. nov.: type *Helix georgiana* Quoy and Gaimard.
Strangesta gen. nov.: type *Helix leichardti* Cox.
Murphitella gen. nov.: type *Helix franklandiensis* Forbes.
Murphitella froggatti sp. nov
Namoitena subgen. nov.: type *Helix namoiensis* Cox.
Chloritobadistes gen. nov.: type *Helix victoriae* Cox.
Chloritisanax gen. nov.: type *Helix banneri* Pfeiffer.
Offachloritis gen. nov.: type *Helix dryanderensis* Cox
Tolgachloritis gen. nov.: type *Chloritis jacksoni* Hedley.
Obsteugenia gen. nov.: type *Chloritis inflecta* Hedley.
Gloreugenia gen. nov.: type *Helix coxeni* Cox.
Kimboraga gen. nov.: type *Chloritis micromphala* Gude.
Eximiorhagada subgen. nov.: type *Xanthomelon asperrimum* Hedley.
Halmatorhagada subgen nov.: type *Helix bordaensis* Angas.
Divellomelon gen. nov.: type *Thersites hillieri* Smith.
Vidumelon gen. nov.: type *Hadra wattii* Tate.
Granulomelon gen. nov.: type *Hadra grandituberculata* Tate.
Semotrachia gen. nov.: type *Thersites basedowi* Hedley.
Catellotrachia subgen nov.: type *Hadra winneckeana* Tate.
Spernachloritis subgen. nov.: type *Hadra setigera* Tate.
Sinumelon godfreyi nom. nov for *Helix angasiana* Pfeiffer.
Meracomelon gen. nov.: type *Helix rufofasciata* Brazier.
Exilibadistes subgen. nov.: type *Helix bednalli* Brazier = *sutilosa* Deshayes.
Amplirhagada subgen, nov.: type *Helix sykesi* Smith.
Plectorhagada subgen. nov.: type *Helix plectilis* Benson.
Globorhagada subgen. nov.: type *Helix prudhoensis* Smith.
Setomedea gen. nov.: type *Suteria seticostata* Hedley.
Pasmaditta gen. nov.: type *Helix jungermanniae* Petterd.
Miselaoma gen. nov.: type *Helix weldii* Tenison-Woods.

Mulathena gen. nov.: type *Helix fordei* Brazier.
Pedicamista gen. nov.: type *Helix caesus* Cox.
Laomavix gen. nov.: type *Helix minima* Cox = *collisi* Brazier.
Geminoropa gen. nov.: type *Helix antialba* Beddome.
Pernagera gen. nov.: type *Helix albanensis* Cox.
Dentherona gen. nov.: type *Helix dispar* Brazier.
Elsothera gen. nov.: type *Helix sericatula* Pfeiffer.
Stenacapha gen. nov.: type *Helix savesi* Petterd.
Oreomava gen. nov.: type *Helix otwayensis* Petterd.
Oreomava johnstoni nom. nov. for *H. otwayensis* var. *alpina* Johnston.
Pillomena gen. nov.: type *Flammulina meraca* Cox and Hedley.
Torresiropa gen. nov.: type *Helix spaldingi* Brazier.
Torresiropa mella nom. nov. for *H. spaldingi* var. *carinata* Brazier.
Delinitesta gen. nov.: type *Helix gayndahensis* Brazier.
Thryasona gen. nov.: type *Helix diemenensis* Cox.
Theskelomensor gen. nov.: type *Helix lizardensis* Pfeiffer.
Westraltrachia gen. nov.: type *Trachia froggatti* Ancey.
Oreokera gen. nov.: type *Flammulina cumulus* Odhner.
Torresitrachia gen. nov.: type *Helix endeavourensis* Brazier.
Gonobaudinia gen. nov.: type *Helix baudinensis* Smith.
Setobaudinia gen. nov.: type *Helix collingii* Smith.
Ventopelita gen. nov.: type *Helix leucocheilus* Cox = *mariae* Cox.
Arnemelassa gen. nov.: type *Helix creedi* Cox.
Australgibba sub. gen. nov.: type *Helix wesselensis* Cox.
Turrisitala gen. nov.: type *Helix turriculata* Cox.
Turrisitala normalis nom. nov. for *Helix turriculata* Cox.
Dendronitor gen. nov.: type *Microcystis inscensa* Hedley.
Westracystis gen. nov.: type *Lamprocystis lissa* Smith.
Malandena gen. nov.: type *Macrochlamys suturalis* Odhner.
Eclogarinia gen. nov.: type *Diplommatina gowllandi* Brazier.
Famarinia gen. nov.: type *Diplommatina egregia* Hedley.
Omphalorissa gen. nov.: type *Georissa multilirata* Brazier.
Ditropisena gen. nov.: type *Cyclophorus macleayi* Brazier.
Suavocallia gen. nov.: type *Callia splendens* Dohrn.

STUDIES IN ICHTHYOLOGY.

No. 7.*

By GILBERT P. WHITLEY,

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(Plates XI-XV and Figures 1-4.)

Family **DASYATIDAE.**

To the Parliamentary Report of the Marine Department of Queensland for 1902-3, the late Dr. Jas. R. Tosh contributed an appendix[1] which is of importance to students of our marine biology. It is entitled "Notes on the Habits, Development, Etc., of The Common Food Fishes of Moreton Bay," and is illustrated by twelve plates. These depict stingrays, mullets, and various other fishes, and show the development of the eggs of the mullet, bream, blackfish (*Girella*), and others. All the species have been included in the Queensland List,[2] but Tosh left a few without specific names, thus:

Dasyatis sp. The common brown stingray. *Op. cit.*, p. 19, pl. iv, fig. 3.

Heteroscarus sp. (?) *Op. cit.*, p. 20, pl. vi. fig. 3, and

Neopercis sp. *Op. cit.*, p. 20, pl. vii, fig. 4.

The stingray is evidently *Dasyatis fluviorum* Ogilby, though this species is not a true *Dasyatis*[3] as there is a fold, not a keel, below the tail, and would be better regarded as the orthotype of a new genus.

Toshia gen. nov.

Orthotype *Dasyatis fluviorum* Ogilby.[4]

Disc with spines and tubercles, especially on scapular region. Tail elongate, more than twice the length of the disc, with a fold above and below. One or two dorsal spines, but no rays. Seven buccal papillae.

These characters sufficiently distinguish *Toshia* from *Dasyatis* as defined by Garman.[5]

Toshia fluviorum grows to a width of about one foot and, as its name implies, is a river-inhabiting species. The trawlers bring to light from the continental

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* For No. 6, see Records of the Australian Museum, vol. xviii, No. 6, 1932, p. 321.

[1] Appendix No. 7, 1903, pp. 17-24, pls. i-xii. Govt. Printer, Brisbane.

[2] McCulloch and Whitley, Mem. Qld. Mus. viii, 2, 1925, pp. 125-182.

[3] Rafinesque, Ind. itt. Sicil., May, 1810, p. 49 (*fide* Sherborn, Ind. Anim.), Type *D. ujo* Rafinesque = *Raja pastinaca* Linné (*fide* Jordan, Gen. Fish.).

[4] Ogilby, Proc. Roy. Soc. Qld. xxi, 1908, p. 6; figured by McCulloch, Biol. Res. Endeavour iii, 1915, p. 103, pl. xvi, fig. 1.

[5] Garman, Mem. Mus. Comp. Zool. Harv. xxxvi, 1913, p. 375.

shelf of New South Wales and more southern waters a group of much larger stingrays, hitherto wrongly included in *Dasyatis,* which should be generically separated, so I propose

Bathytoshia gen. nov.

Orthotype *Dasyatis thetidis* Waite[6] = *Bathytoshia thetidis.*

Disc about four times as wide as in *Toshia fluviorum.* Nasoral lobes wider than mouth and spiracles diverging more widely posteriorly than in *Toshia.* Tail with a fold below, none above; it is shorter than in *Toshia* and armed with prominent spines. The dorsal spine is more elongate, the body smooth, and the ventrals less covered by the pectorals than in the fluviatile genus.

This genus tentatively includes also *Trygon brevicaudatus* Hutton = *Bathytoshia brevicaudata,* which has been described and figured by McCulloch.[7]

The fish doubtfully regarded by Tosh as *Heteroscarus* was called *Scarus* sp. by McCulloch and Whitley (*loc. cit.,* p. 169), but is evidently the same as that called *Callyodon cyanotaenia* (Bleeker) by Ogilby.[8] Unfortunately, Tosh does not mention colour in his brief description:

"D. 9-10, A. 1/10, L. lat. 25. Not common. Said to attain a large size. Front teeth fused to form two in each jaw. Three large scutes at the base of the tail. A few small specimens were taken in the beginning of May." On comparing Tosh's figure with that in Bleeker's "Atlas Ichthyologique," the Queensland fish is seen to differ in having three rows of scales on its deeper cheeks, fewer fin-rays, and arborescent tubes on the lateral line. As it is apparently unnamed, I propose that it be known as *Scarus toshi,* new species. Type-locality: Southport, Moreton, Bay, Queensland.

The "*Neopercis* sp." is briefly characterised by Tosh, thus:

"D. 5-22, A. 1/18, L. lat. 78. Another of the whiting family. Colour, red, with fairly broad black vertical bands. Usually too small to count as a food fish."

This is evidently the Queensland form[9] of *Chilias nebulosus* (Quoy and Gaimard).

Family **GALAXIIDAE.**

Genus **Galaxias** Cuvier, 1816.

Galaxias oconnori Ogilby.

(Plate xii, fig. 3.)

Galaxias oconnori Ogilby, Mem. Qld. Mus. i, Nov. 27, 1912, p. 33, Lyra, South Queensland.

The accompanying illustration is from a drawing of the type in the Queensland Museum made by the late Dene B. Fry.

Galaxias pseudoscriba McCoy[10] and *Galaxias scottii* Ogilby, 1886 (*a nomen nudum*) = *Austrocobitis attenuatus scriba* (Cuvier and Valenciennes).

Galaxias dissimilis Regan.

(Plate xii, fig. 2.)

Galaxias dissimilis Regan, Proc. Zool. Soc. Lond., 1905, ii, April 5, 1906, p. 383, N.S. Wales(?).

This species, like the last, has not hitherto been figured. The present illustration was made from the type in the British Museum by the author of the species, which may not be congeneric with *oconnori.*

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[6] Waite, Austr. Mus Mem. iv, 1899, p 46. Newcastle Bight and Wata Mooli, N.S. Wales.
[7] McCulloch, Biol. Res. Endeavour iii, 1915, p. 102, pl. xv, fig. 1 and pl. xvii, fig. 1.
[8] Ogilby, Mem. Qld. Mus. iii, 1915, p. 135.
[9] McCulloch, Biol. Res. Endeavour ii, 1914, p. 156.
[10] McCoy, Intercol. Exhib. Essays, No. 7, 1866, p. 320 (14 of reprint). Yarra River, Victoria.

Family **MYCTOPHIDAE.**

Genus **Electrona** Goode and Bean, 1895.

Electrona risso salubris, new subspecies.

Electrona rissoi McCulloch, Biol. Res. Endeavour iii, 1915, p. 104. Victoria. Not *Scopelus risso* Cocco, Giorn. Sci. Lett. Sicilia xxvi, 1829, p. 144, Messina (*fide* Sherborn).

A deepsea lantern fish, the type of which was noticed by McCulloch, but his specimen differs from the typical Mediterranean *Scopelus risso* Cocco, 1829, in being larger in size and of slightly different proportions.

D. 14, A. ii, 18, L. lat. 30. Standard length 69 mm. or about 3¼ inches total length. Trawled between Gabo Island and Cape Everard, Victoria. **Austr. Mus.** regd. no. E. 5701.

Myctophum carlsbergi Taning[11] from New Zealand, referred to *Electrona* by its author, has 36 scales on the lateral line and a more elongate form.

Genus **Collettia** Goode and Bean, 1895.

Collettia Goode and Bean, Spec. Bull. U.S. Nat. Mus. ii (Oceanic Ichth), June, 1895, pp. 71 and 88. Orthotype, *Nyctophus rafinesquii* Cocco, N. Ann. Sci. Nat. ii, 1838, p. 180, from the Mediterranean.

The formation of the luminous glands before the eyes distinguishes this genus from *Diaphus*[12] and *Aethoprora.*[13]

Cavelampus subg. nov.

Orthotype, *Æthoprora perspicillata* Ogilby.

Antorbital luminous organ large, divided into a dorso-nasal[14] and suborbital organ. Mouth extending well behind eye. Preopercular border oblique.

Photophores situated below the lateral line, excepting the highest SAO and the POL., 4 Prc., the uppermost below the lateral line. First AO elevated. VLO about midway between lateral line and ventral fins or a little nearer the latter. No luminous scales or patches on caudal peduncle. Ventrals behind the vertical of the dorsal origin. Anal entirely behind dorsal, both fins with an equal number of rays.

Collettia perspicillata (Ogilby).

(Figure 1.)

Æthoprora perspicillata Ogilby, Proc. Linn. Soc., N.S. Wales, xxiii, 1898, p. 36. Lord Howe Island. *Id.* Waite, Rec. Austr. Mus. v, 1904, p. 193, pl. xviii, fig. 1.

Diaphus danae Taning, Vidensk. Medd. Dansk. Foren., xciv, 1932, p. 140, fig. 13. North of New Zealand.

[11] Taning, Vidensk. Medd. Dansk. nat. Foren., xciv, 1932, p. 126, fig. 1. East of New Zealand.

[12] Eigenmann and Eigenmann Proc. Calif. Acad. Sci. (2) iii, Sept. 1, 1891, p. 3. Orthotype, *D. theta* Eig. and Eig. from California. "Characters of *Myctophum*; phosphorescent spots divided into halves by a medium black line."

[13] Goode and Bean, *Op. cit.* 1895, pp. 71 and 86. Three species:— *Nyctophus metopoclampus* [*Myctophum metopoclampum*] Cocco, *A. lucida* G. and B., and *A. effulgens* G. and B. Logotype, *A. metopoclampa,* selected by Jordan and Evermann, 1896 (where the descriptions of *Collettia* and *Aethoprora* are transposed) and in Zool. Record.

[14] The nomenclature of the luminous organs and photophores follows that of Taning and other modern authors.

The form of the antorbital luminous organs is variable and their limits difficult to define in some specimens. A series in the Australian Museum was labelled under two generic and three specific names, yet all appear to be the same species and *Diaphus danae* is evidently a synonym.

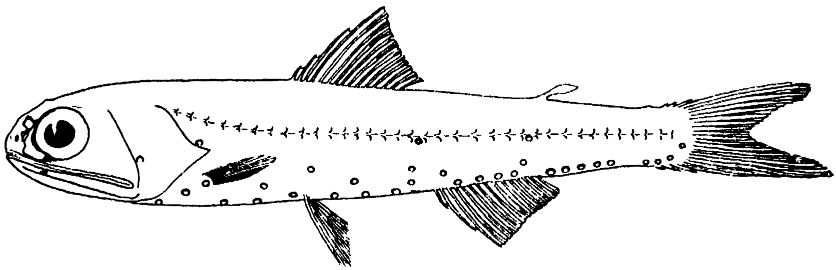

Figure 1.

Collettia (*Cavelampus*) *perspicillata* (Ogilby). A specimen, 67 mm. in standard length, from Lord Howe Island. Austr. Mus. regd. No. IA.5632. G. P. Whitley *del.*

D. 15; A. 15; P. 12; V. 8; C. 19; L. lat. 35.

Head (20 mm.) 3.35, depth at level of pectoral base (12) 5.5 in standard length (67). Snout (4) 5 in head. Eye (6) equal to interorbital (6) and subequal to depth of caudal peduncle.

Head scaly, the operculum ending in a pointed flap. Villiform teeth on jaws, vomer, and palatines. Tongue free. Gillrakers protruding forward into mouth; they are elongate, rugose, and there are 15 of them on the first branchial arch. A small dorso-nasal and a large suborbital luminous organ.

Body elongate, compressed. Most of the scales are missing, but those remaining are thin, cycloid, and highly burnished. 3 Br. photophores; 1 Op; 2 PVO; 1 PLO over opercular flap; 4 PO, diverging widely posteriorly; VLO nearer ventral fin than lateral line; 4 VO, the second pair higher on the sides than the others; 3 SAO in a steeply ascending series, the uppermost remote from the others; 6 AO ant., the anterior and posterior elevated; POL below a lateral line scale; 5 AO post.[15] in a straight line; 4 Prc. the last below the lateral line.

The general appearance of this fish is shown in the diagram and defined for the subgenus. The fourth dorsal ray is longest and the adipose fin is well-developed. The anal and dorsal fins have equal basal lengths and fin-counts.

General colour, in alcohol, brownish with blackish areas at the bases of the dorsal and caudal fins. Photophores shining silvery with black margins. Fins whitish. Head burnished and silvery, yellow on snout, blackish on vertex and interorbital. A brown smudge on each side of the chin below the bluish eyes.

Described and figured from a specimen 3¼ inches in total length or 67 mm. is standard length.

Loc.—Washed up on Blinkenthorpe Beach, Lord Howe Island; collected by Mr. Robert Baxter in 1922. Australian Museum regd. No. I.A. 5632.

[15] Postabdominal (PA) would be a better term for AO post or Postero-AO, *i.e.*, "Postero-antero-anal," photophores.

Six other specimens (Nos. IA. 957-959, 1827, and 2425) from Lord Howe Island are preserved in the Australian Museum. In most the small dorso-nasal organ is quite distinct from the suborbital one, but in others it becomes difficult to distinguish the limits of the luminous organs on the front of the head. Young specimens are infuscated with blackish punctulations on the body and the larger specimens have the fins, especially the caudal, similarly dotted.

Genus **Gonichthys** Gistel, 1850.

Alysia Lowe Proc. Zool. Soc., Lond., vii, Oct., 1839, p. 87. Haplotype *A. loricata* Lowe, from Madeira, = *Scopelus cocco* Cocco, Giorn. Sci. Lett. Sicilia, xxvi, 1829, p. 143, *fide* Jordan, Gen. Fish. Preocc. by *Alysia* Latreille, 1804, Hymenoptera.

Gonichthys Gistel, Isis (Munich) (5) 1850, p. 71. Haplotype, *G. loricatus* (Lowe), *fide* Sherborn, Index. Anim. 1801-50, pt. 29, June, 1932, p. 84.

Rhinoscopelus Lütken, Vid. Selsk. Skr. (6) vii, Spolia Atlantica, 1892, p. 242. Type, *Scopelus coccoi* Cocco (*fide* Jordan, Gen. Fish).

In the comparatively few additions and corrections to Sherborn's remarkably accurate and indispensable Index Animalium, there is a reference to *Gonichthys* Gistel, a name which has been overlooked by ichthyologists, and which replaces *Rhinoscopelus* for *Alysia* preocc. The type species, generally called *Rhinoscopelus coccoi,* should now be known as *Gonichthys cocco.*

Genus **Serpa** Cloquet, 1827.

"Serpe" Risso, Ichth. Nice, 1810, p. 356. Purely vernacular name for *Gastero-pelecus* spp. Risso, described as *S.* (not *G.*) *microstoma, crocodilus,* and *humbolti,* but correctly indexed.

Macrostoma, Risso. Hist. Nat. Eur. Merid. iii, 1826, p. 447. Haplotype *M. angustidens* Risso, from the Mediterranean. Preoccupied by *Macrostomus* Wiedeman, 1817, Diptera.

Serpa Cloquet, Dict. Sci. Nat. xlviii, 1827, p. 190. Latinisation of "Serpe" Risso, 1810, vernac. Logotype, *S. crocodilus* Cloquet, from Nice, by present designation.

Lampanyctus Bonaparte, Icon. Faune. Ital. (27) 1840 (*fide* Sherborn). Logotype, *Nyctophus bonaparti* Cocco, N. Ann. Sci. Nat. ii, 1838, p. 189.

? *Catablemella* Eigenmann and Eigenmann, Proc. Calif. Acad. Sci. (2) iii, Sept. 1, 1891, p. 24. Orthotype, *Notoscopelus brachychir* Eig. and Eig., from Cortes Banks, California.

Panyctus Parr. Proc. N. Eng. Zool. Club xi, 1929, p. 57. *Errore pro Lampanyctus.*

Serpe Sherborn, Index Anim. 1801-50 (1930), pp. 1649 and 5903. Latinisation of "Serpe" Risso, 1810, vernac. Logotype, *S. crocodilus,* by present designation.

Most authors use *Lampanyctus* as the name of this genus, but *Macrostoma* and *Serpa* are earlier. *Macrostoma* is preoccupied, so *Serpa* should apparently be used. This name was proposed by Cloquet for the "Serpe" of Risso, including two species, *Scopelus crocodilus* and *S. humbolti* (Risso) Cloquet. I select *Scopelus crocodilus* as the logotype of *Serpa*.

The only Australasian species is *Serpa australis* Taning.[16]

Family **PLOTOSIDAE.**

Exilichthys gen. nov.

Orthotype, *Cnidoglanis nudiceps* Günther.[17]

Occipital region osseous, not covered with loose skin. Head small, depressed, with the gill-membranes not united across isthmus.

Günther's species, though included in McCulloch's Check-List, is not strictly Australian, having been described from the Arafura Sea; the Australian limit was Challenger Station, 188, after which Aru Islands were visited. The type specimen has been figured by Weber and Beaufort.[18]

McCulloch[19] placed this species in *Ostophycephalus* Ogilby,[20] but that generic name is applicable only to the South Australian *O. duriceps* Ogilby which Waite[21] regarded as *Cnidoglanis megastoma* (Richardson), a species with much shorter body, larger head and mouth, and quite different dentition.

Family **SYNGNATHIDAE.**

Genus **Penetopteryx** Lunel, 1881.

Penetopteryx Lunel, Mem. Soc. Phys. List. Nat. Genève, xxvii, 2, 1881, p. 11.

Haplotype, *P. taeniocephalus* Lunel, spelt *Penetopterix* on pl. i, fig. 1. *Id.* Sauvage, Hist. Nat Madagasc. (Grandidier), 1891, p. 508 (*fide* Duncker). *Id.* Duncker, Mitt. Naturh. Mus. (2 Beih.), Wiss. Anstalt., Hamburg, **xxix**, 1912, p. 235, *et ibid,* xxxii, 1915, p. 101.

A remarkable genus of pipefishes in which the dorsal, anal, and pectoral fins are absent and the caudal is much reduced. It is evidently rare, and is now recorded for the first time from the tropical Pacific Ocean.

Penetopteryx fowleri sp. nov.

C. 9 or 10. Rings 20 + 44 = 64.

Head (6 mm.) 10.5, depth of body (3) 21, in total length (63 mm.).

Eye (1) greater than interorbital and slightly less than length of caudal, half as long as snout (2).

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[16] Taning, Vidensk. Medd. Dansk. nat. Foren xciv, July 19, 1933, p. 145, as *Lampanyctus alatus australis.*
[17] Günther, Rept. Voy. "Challenger," Zool. i, 6, 1880, p. 49.
[18] Weber and Beaufort, Fish Indo-Austr. Archip. ii, 1913, p. 232, fig. 92.
[19] McCulloch, Austr. Mus. Mem. v, 1929, p. 59.
[20] Ogilby, Proc. Linn. Soc. N.S. Wales xxiv, Aug. 8, 1899, p. 155.
[21] Waite, Rec. S. Austr. Mus. ii, 1921, p. 46.

Upper profile of head subhorizontal with a concave dip before the eyes, lower profile oblique. Eyes large and bulbous; mouth minute. No ridges or granules on operculum.

Body elongate, with the ridges not sharp. Dorsal ridges of trunk and tail continuous. Mediolateral ridges of body continuous with inferior ridges of tail. A ventral keel on the body, ceasing at the anus. Broodpouch with full, soft flaps, subcaudal, occupying thirteen rings. Eggs in two rows, partly embedded in the soft integument of the tail. Caudal fin rounded, its base slightly overlapped by the last of the lengthening and tapering tail-rings. The raised areas on the body rings and the shields between them do not form knobs but ridges which, notably on the ventral surface of the body, tend to fuse and give a reticulated appearance.

General colour, in alcohol, brown, with the head yellowish.

Four or five dark-brown bands radiate from the eye across the snout and cheeks, and three of them cross the chin; three others cross the interorbital. An irregularly curved band almost encircles the head behind these, but is asymetrical on the top of the head so that the left side fails to join the right and lies ahead of it. A similar band crosses the opercula and joins its fellow of the other side below the head, but above is interrupted by two short transverse bars. Five longitudinal rows of brown spots, surrounded by lighter margins, on the body from about the fifth to the fifteenth ring. Five or six anterior rings whitish, speckled with black, on the breast. Remainder of body and tail fairly uniform straw-brownish.

Described from the unique holotype, a male about 2¾ inches long, collected by Allan R. McCulloch in the New Hebrides. Austr. Mus. regd. no. IA 781.

Differs from *P. taeniocephalus* Lunel from Mauritius in having no granules on operculum or around vent, broodpouch not extending so far back on the tail-rings, and in its colouration, especially on the body, but Lunel's excellent description and figure clearly show that the two species are closely allied. *Apterygocampus epinnulatus* Weber[22] is of much smaller size, has fewer body and tail rings, and quite different colouration, so should probably be retained in the separate genus *Apterygocampus* Weber, 1913.

Named in honour of Mr. Henry Weed Fowler, of Philadelphia, whose "Fishes of Oceania" is indispensable for identifying Pacific species.

Genus **Syngnathus** Linné, 1758.

Subgenus **Parasyngnathus** Duncker, 1915.

Syngnathus (Parasyngnathus) maxweberi sp. nov.

Syngnathus punctatus Weber, Siboga Exp. Fische, May, 1913, p. 113, fig. 36, Sumbawa, East Indies. *Id.* Weber and Beaufort. Fish. Indo-Austr. Archip., iv, 1922, p. 86, fig. 36.

Preoccupied by *S. punctatus* Rafinesque, Ind. itt. Sic., 1810, pp. 37 and 57.

According to Sherborn's Index Animalium, Weber's name is preoccupied by that of Rafinesque, so I rename the species after the eminent Dutch zoologist.

[22] Weber, Siboga-Exped. Fische, May, 1913, p. 116, and *Penetopteryx epinnulatus* Weber and Beaufort, Fish Indo-Austr. Archip. iv, 1922, p. 96, fig. 40. Gisser, west of Ceram.

Dunckerocampus gen. nov.

Acanthognathus Duncker, Mitt. Naturh. Mus. (2 Beih. Jahrb. Wiss. Aust.), Hamburg, xxix, 1911 (1912), p. 228 *et ibid.*, xxxii, 1915, p. 41. Orthotype, *Syngnathus dactyliophorus* Bleeker, 1853. Preoccupied by *Acanthognathus* Mayr, Verh. Zool. Bot. Wien., xxxvii, 1887, p. 578, a genus of Hymenoptera.

The *Zoological Record* shows that *Acanthognathus*, a genus of pipefishes, is preoccupied, so it is renamed as above, the genotype being *Syngnathus dactyliophorus* Bleeker[23] = *Dunckerocampus dactyliophorus*.

Family BELONIDAE.

Lewinichthys gen. nov.

Orthotype, *Belone ferox* Günther[24] = The Slender Long Tom (*Lewinichthys ferox*).

Form slender; caudal peduncle as broad as deep. Middle and posterior dorsal rays short and subequal in length; anal fin with twenty-five or twenty-six rays. Length three feet.

Lhotskia gen. nov.

Orthotype, *Belone macleayana* Ogilby[25] = The Stout Long Tom (*Lhotskia macleayana*).

Form deep; caudal peduncle as broad as deep. Anal fin with nineteen to twenty-one rays. Length up to 4½ feet.

Other differences between *Lewinichthys* and *Lhotskia* are very apparent from the excellent illustrations in Stead's Edible Fishes of New South Wales, 1908, pl. x.

The following nomina nuda may be formally designated synonyms of *Tylosurus impotens* Ogilby = *Lhotskia macleayana* (Ogilby):

Belone staigeri Saville-Kent, 1893.

Belone tyranus Saville-Kent, 1893.

Belone vorax Saville-Kent, 1893.

Tylosurus howesi Ogilby, 1907.

Tylosurus thomasonia jacobus Napier, 1928.

Family SCHEDOPHILIDAE.

Genus **Hoplocoryphis** Gill, 1862.

Hoplocoryphis Gill, Proc. Acad. Nat. Sci. Philad., 1862, p. 127. Orthotype, *Schedophilus maculatus* Günther.

[23] Bleeker, Nat. Tijdschr. Ned. Ind. iv, 1853, p. 506, Onrust I., Batavia.
[24] Günther, Cat. Fish. Brit. Mus. vi, 1866, p. 242. Sydney.
[25] Ogilby, Cat. Fish N.S. Wales, 1886, p. 53. N.S. Wales.

Hoplocoryphis physaliarum sp. nov.

(Plate xii, fig. 4.).

Schedophilus maculatus Ogilby, Rec. Austr. Mus. ii, Sept., 1893, p. 68 (Manly Beach, N.S.W.). *Id.* Waite, Proc. Linn. Soc., N.S. Wales (2), ix, Dec., 1894, p. 219 (Maroubra, N.S.W., and Lord Howe Island). *Id.* Waite, Rec. Austr. Mus. v, 1904, p. 163, pl. xx, fig. 1 (Lord Howe Island). *Id.* Waite, Trans. N.Z. Inst. xlii, 1910, p. 375 (Kermadecs). *Id.* Waite, Trans. Roy. Soc. S. Aust., xl, 1916, p. 453 (Norfolk Island, etc.). *Id.* McCulloch Austr. Zool., ii, 2, 1921, p. 43, pl. xvi (N.S. Wales). *Id.* McCulloch, Austr. Mus. Mem., v, 1929, p. 124. Not *Schedophilus maculatus,* Günther, Cat. Fish. Brit. Mus., ii, 1860, p. 412, from China.

Leirus maculatus Ogilby, Mem. Qld. Mus., v, 1916, p. 185 (Moreton Bay, Queensland).

The receipt of a specimen of "*Schedophilus maculatus*" from Maroubra, N.S. Wales, where it was washed ashore amongst many large bluebottles (*Physalia*) on 4th October, 1932, led me to compare the description of the typical and Australian forms.

The latter may be regarded as a distinct species, as it has seven or more spots on base of dorsal fin, and four on that of anal as opposed to four spots on the base of the dorsal fin and three on that of the anal in the Chinese form.

Ogilby's described specimen from Manly, N.S. Wales, is the holotype. My Maroubra specimen has about four double transverse rows of sub-ocelliform dark-blue spots on a silvery ground colour. The spots and general colour-markings are blue in the fresh fish, though described as brown by authors using alcohol specimens.

The accompanying figure is taken from a small example washed up in Long Bay, N.S.W., in 1903.

Family **HOLOCENTHRIDAE.**

In working over some fishes of this family from Australia and Polynesia, I have been led to the conclusion that many of the species of "*Holocentrus*" are not congeneric and would be better separated into further generic and subgeneric groups which would facilitate their recognition in future. The generic name *Holocentrus* was applied by Gronow in 1763 to two non-binomial species. Scopoli[26] was the earliest writer to give the binary name *Holocenthrus* to Gronow's species, although he misspelt Gronow's name and gave no trivial names. I therefore designate *Holocentrus sogo* Bloch, 1790, as the logotype of *Holocenthrus* Scopoli, which is earlier than *Holocentrus* Meuschen or Bloch. Various authors have emended the name to *Holocentrum.* New subgeneric names may be proposed as follows:—

Faremusca nov. Orthotype, *Holcentrum punctatissimum* Cuv. & Val.[27]

Head obtusely pointed. Two or three not very large opercular spines. Anterior spine of preorbital not markedly larger than others. Body not striped but usually densely spotted. Spinous dorsal fin with a median curved band of brown blotches. Less than 50 scales in lateral line.

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[26] Scopoli, Introd. Hist. Nat. 1777, p. 449, No. 250. Based on *Holocentrus* Gronow, Zoophylac, i, 1763, p. 65, non-binomial.

[27] Cuvier and Valenciennes, Hist. Nat. Poiss. iii, April, 1829, p. 215. Strong I. Now *Holocenthrus (Faremusca) punctatissimus.*

Kutaflammeo nov. Orthotype, *Holocentrum tahiticum* Kner.[28]

Superficially like the genus *Flammeo* Jordan and Evermann[29] (not *Flammea* Fournel, 1836, Aves) from Martinique, but with preorbital strongly toothed. Body elongate, striped. Penultimate anal spine extremely long. Dark bars on fins and a large black blotch on anterior portion of spinous dorsal.

Cephalofarer nov. Orthotype *Holocentrum sicciferum* Cope.[30]

Profile of nape excavated. Nostrils without spines. Three spines on upper part of operculum. About 40 scales on lateral line. Scales along base of spinous dorsal each with a small backwardly-directed spine.

Lack of type-specimens prevents me from determining at present the status of the generic names *Harpage* De Vis, 1884 (not *Harpagus* Vigors, 1824, Aves, or Stephens, 1834, Lepidoptera, and "Harpago" Klein, pre-Linnean); *Neoniphon* Castelnau, 1875, which is apparently allied to *Sargocentron* Fowler, 1904; and *Neomyripristis* Castelnau, 1873. *Howella* Ogilby, 1898, is closely allied to *Rhectogramma* Norman, 1930, and both should apparently be separated from the Holocenthridae in the family Howellidae. The generic name *Farer*, attributed to Forskaal, 1775, is invalid, as Forskaal merely used this Arabic vernacular name for a subdivision of *Sciaena*, and *S. sammara* Forskaal, with eight branchial rays, is not even a typical "*Farer*."

In his Index Animalium, Sherborn quotes *Holocentrus atraria* Meuschen,[31] and this would appear to be the earliest binomial name for the typical *Holocenthrus sogo* Bloch, but I am unable to consult Meuschen's 1778 work. In his index to Gronow's Zoophylacium, Meuschen, in 1781, named Gronow's species, No. 224, *Holocentrus* seu *Perca atraria?* As this is not *Perca atraria* Linné, 1766, from Carolina, *H. sogo* Bloch apparently stands.

Family **REGALECIDAE.**

Genus **Regalecus** Ascanius, 1772.

Regalecus Ascanius, Icones rerum nat., ii, 1772, p. 5. Haplotype, *R. glesne* Ascanius (*fide* Sherborn, Index Animalium). *Id.* Müller, Zool. Dan. Prodr., 1776, pp. xx and 40.

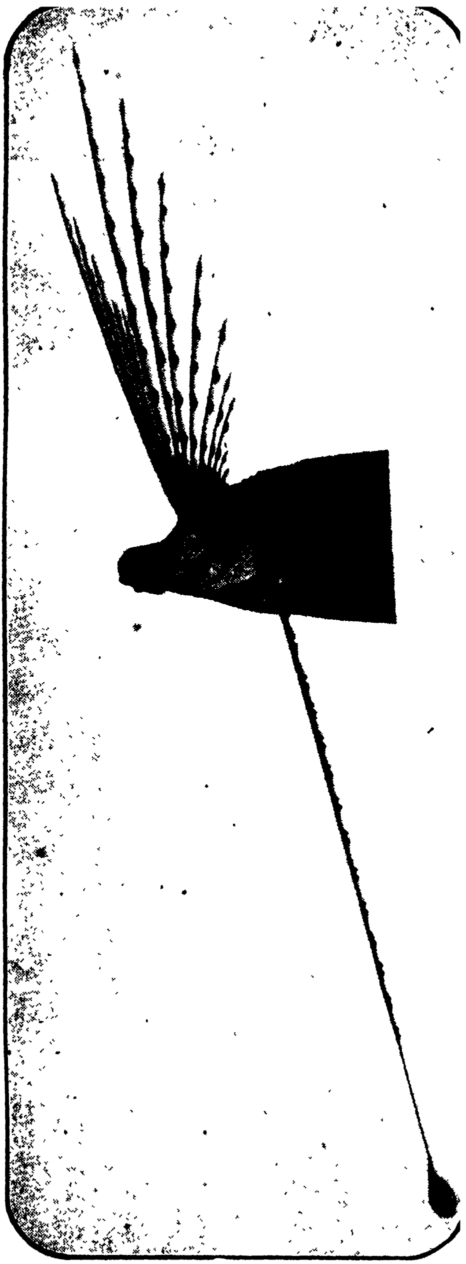
I have not seen the original description of this genus, but Müller describes it as having the head with laminated covering, ventral fins threadlike, with long pectoral cirri, and the anterior rays of the dorsal fin free and rather spine-like. This account is applicable to the Oar-Fish. *Gymnetrus* Bloch, 1795; *Cephalepis* Rafinesque, 1810 (variously spelt by authors); *Xypterus* Rafinesque, 1810; *Epidesmus* Ranzani, 1818; and *Xiphicthus* Swainson, 1839, are all said to be synonyms of *Regalecus*, but lack of literature prevents me from confirming this synonymy. The Oar-Fish is also known as King of the Herrings, hence the scientific name, from *Rex halecum*.

[28] Kner, Sitzb. Akad. Wiss. Wien xxix, 1864, p. 482, and Reise Novara, Fische i, 1865, p. 9, pl. i, fig. 2. Tahiti. Now *Holocenthrus* (*Kutaflammeo*) *tahiticus*.

[29] Jordan and Evermann, Bull. U.S. Nat. Mus. xlvii, Nov., 1898, p. 2871. Orthotype, *Holocentrum marianum* Cuv. and Val.

[30] Cope, Trans. Amer. Philos. Soc. Philad. xiv, 1871, p. 465, *fide* Fowler, Proc. Acad. Nat. Sci. Philad., April 7, 1904, p. 233, fig. 5. Bahamas. Now *Holocenthrus* (*Cephalofarer*) *siccifer*.

[31] Meuschen, Mus. Gronov. 1778, p. 25.



Regalecus pacificus Haast. Anterior end of a specimen, 11 feet 4 inches long, from New Plymouth, New Zealand W. F. Gordon *photo.*

Regalecus pacificus Haast.

(Figure 2.)

Regalecus pacificus Haast, Trans. N.Z. Inst., x, May, 1878, p. 246, pl. vii, New Brighton, New Zealand.

Regalecus argenteus Parker, Trans. N.Z. Inst., xvi, May, 1884, p. 284, pl. xxiii, Moeraki, Otago, New Zealand.

Regalecus masteri De Vis, Proc. Ann. Meet. Roy. Soc. Qld., 1890 (1891), p. 13, *Nomen nudum.*

Regalecus masterii De Vis, Proc. Roy. Soc. Qld., viii, 4, 1892, p. 110, Tweed River District, South Queensland.

The accompanying figure by Mr. W. F. Gordon illustrates the head of an Oar-Fish, which was washed ashore at New Plymouth, New Zealand, in November, 1895. Its length was given as 11 feet 4 inches.

The Oar Fish has been recorded, from specimens which have come to light at rare intervals, from various Australasian localities, but further captures are well worth noting. Various authors have called it by many names: *Regalecus banksi, R. glesne, R. grilli, R. gladius,* and *Gymnetrus* sp., but these refer to the Palaearctic species from which our form has been specifically separated. The earliest Australasian name available is evidently *R. pacificus* Haast, with the synonyms noted above. McCoy gave a splendid figure of this species as *R. banksi* in his Prodromus of the Zoology of Victoria, whilst Waite[32] was the first to record it from New South Wales. His specimen from Shark Beach, Port Jackson, is still in the gallery of the Australian Museum (regd. No. I. 4305). McCulloch noted, in manuscript, two specimens from Manly, New South

[32] Waite, Rec. Austr. Mus. iii, Dec., 1899, p. 163.

Wales, on 10th August, 1915, but these were not preserved. The Museum has recently received another New South Wales specimen (regd. No. IA5545) from Port Kembla, where it was found by Mr. H. Morshell on 27th July 1932, floating on the ocean surface after stormy weather. This specimen is about nine and a half feet long, but is cut in two, and otherwise considerably damaged so that an accurate description of it is not practicable. Nevertheless the record is of interest and gives me an opportunity for remarks upon some taxonomic features associated with the Australasian Ribbon Fish and Oar Fish fauna. *Regalecus pacificus* Haast is now known from off the South of Queensland, New South Wales, Victoria, Tasmania, South Western Australia, New Zealand and the Chatham Islands. Alexander[33] recorded it from Rottnest Island, but, through inadvertence, Western Australia was omitted from its range in McCulloch's 1929 check-list. A further specimen was noted in the local press from northern New South Wales in May, 1933.

The species called *Regalecus glesne pacificus* Wood Jones by Weber and Beaufort[34] is not Haast's Australasian species, but an East Indian one, charmingly described by Professor Wood Jones in his "Unscientific Essays." As his species has a preoccupied name, it may now be called *Regalecus woodjonesi*, sp. nov.

An overlooked synonym of the Palaearctic form of *Regalecus glesne,* called *Gymnetrus banksii* by Cuv. and Val., is *Gymnetrus northumbricus* Timbs,[35] described from Cullercoats, Northumberland, England. An excellent article on this species was given by Couch.[36]

The Indian species named *Gymnetrus hawkeni* by Bloch in 1795 was figured in Russell's Fishes of Vizagapatam, i, 1803, p. 28, pl. xli. Shaw copied the "Russellian Gymnetrus," but Cloquet[37] was the first to name it *Regalecus russelii*, the type of Swainson's genus *Xiphicthis.*

Phillipps[38] has given the generic name *Agrostichthys* to the New Zealand and Stewart Island species, *Regalecus parkeri* Benham,[39] and I consider this a valid genus and species, with the convex head of the Trachipteridae, and an extremely elongate body, quite differently formed from *Regalecus* of similar length.

The skull of *Regalecus* is figured by Gregory (Trans. Amer. Philos. Soc. xxiii, 1933, p. 298, fig. 175).

Family **TRACHIPTERIDAE.**

Genus **Trachipterus** Gouan, 1770.

Trachipterus Gouan, Hist. Pisc. 1770, pp. 104 and 153. *Genus caelebs* based on "Taenia" Artedi, Syn. p. 115, n. 2, etc. Logotype, *Cepola trachyptera* Gmelin (Syst. Nat. (Linn.), ed. 13, 1789, p. 1187, Adriatic Sea), designated by Jordan and Gilbert, Bull. U.S. Nat. Mus. iii, 16, 1882, p. 618. Spelt *Trachyterus* by Bloch and Schneider and *Trachypterus* by Rafinesque and many later authors.

This genus has several nominal synonyms, noted in Jordan's "Genera" and "Classification of Fishes," but some of these may be distinct.

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33 Alexander, Rec. W.A. Mus., i, 3, 1914, p. 236.
34 Weber and Beaufort, Fish. Indo-Austr. Archip. v, 1929, p. 92, fig. 23, south of Sumbawa.
35 Timbs, The Year Book of Facts, 1850, p. 229.
36 Couch, The Intellectual Observer, ii, August, 1862, pp. 1-8, cold. pl. and 2 text figs.
37 Cloquet, Dict. Sci. Nat. xlv, 1827, p. 18.
38 Phillipps, Proc. Zool. Soc. Lond. 1924, ii. p. 232, figs. 1-2.
39 Benham, Trans. N.Z. Inst. xxxvi, Aug., 1904, p. 198, pl. lx. Deborah Bay, near Port Chalmers N.Z.

Trachipterus arawatae Clarke.

The Australian Ribbon Fish, as *Trachipterus jacksonensis* (Ramsay), has been previously described and figured in these Studies.[40]

Specimens are in the Australian Museum from several New South Wales localities.

Registered No.	Locality.	Size.	Collector.
A.9114 ...	Manly	6 feet; type..................	Frederick Johnstone.
A.17712 ...	Port Jackson	7 feet	....
I.1968 ...	,, ,, ...	Three very small	....
I.9838 ...	Manly	Young	T. Sly, 1909.
IA.4671 ...	Trawled off Port Stephens	,, ...	K. Moller.
L.1530 ...	Middle Harbour	About 1925 mm. Figured by Whitley.	Presented Sept., 1922.

Ogilby in 1898 named a 6-inch specimen from Newcastle *T. j. polystictus.*

This species is recorded from Queensland, New South Wales, Tasmania, Victoria, and New Zealand. From the latter place it has been noticed as *T. taenia, T. trachypterus,* and *T. altivelis,* and the records have been listed by Hamilton.[41] If, as seems likely, *Trachypterus arawatae* Clarke[42] is the young of this species, Clarke's name will take precedence over Ramsay's, which was published about a month later.

Family **LOPHOTIDAE**, auct.

Regilophotes gen. nov.

Orthotype, *Lophotes guntheri* Johnston, 1883.

Ribbon Fishes with the forehead much elevated and sloping forward have been recorded from Tasmania, Victoria, and New Zealand as various species of *Lophotes.* Sherborn, in his "Index Animalium," gives the correct spelling and reference to this genus as *Lophotus* Giorna, Mem. Ac. Sci. Turin, 1805-8 (1809), p. 179. In his "Genera of Fishes," Jordan gives *Lophotes cepedianus* Giorna as the genotype, but Sherborn refers to *Gymnetrus cepedianus* Risso, Ichth. Nice, 1810, p. 146, which suggests that Giorna gave no specific name.

Risso's species is, however, a young *Trachipterus,* so the very distinct Australasian genus evidently requires a new name, as above, whilst the family name may eventually also have to be changed.

Regilophotes guntheri (Johnston).

Lophotes guntheri Johnston, Proc. Roy. Soc. Tasm. 1882 (1883), pp. 142 and 177, Emu Bay district, N.W. Tasmania. *Id.* Whitley, *ibid.* 1928 (1929), p. 50, *Ex.* Johnston MS.

As *Lophotes cepedianus* and *L. fiskii,* this species has been recorded from New Zealand,[43] and Kershaw[44] identified a Victorian specimen as *Lophotes cristatus* Johnson, a Madeiran species, but it is probable that all these records refer to Johnston's *L. guntheri,* of which a topotypical specimen, 3 feet 3 inches long, is in the Australian Museum from Emu Bay, Tasmania (regd. No. B. 5776).

[40] Whitley, Rec. Austr. Mus. xv, 1927, p. 296, pl. xxv, fig. 2.
[41] Hamilton, Trans. N.Z. Inst. xlviii, 1916, p. 370, figs. 1-6.
[42] Clarke, Trans. N.Z. Inst. xiii, April, 1881, p. 197, and fig. Arawata, N.Z.
[43] Waite, Trans. N.Z. Inst. xlvi, 1914, p. 130, pl. iv, fig. 2.
[44] Kershaw, Vict. Nat. xxvi, Oct., 1909, p. 78.

The Ribbon Fishes of Australia and New Zealand are now regarded as belonging to only four species, each the representative of a distinct family. They may be classified by a key based on one given by Phillipps[46] as follows:—

Length 6 to 12 times height; lateral line descending little below midway on side of body; ventrals normally present; eye large; teeth on vomer and both jaws; maxillary plate deeper than long; upper profile of head convex	(TRACHIPTERIDAE) *Trachipterus arawatae.*
Length 12 to 30 times height; lateral line descending to within ⅛ of height from ventral surface; ventrals represented by a single filament; eye small; teeth wanting; maxillary plate deeper than long; upper profile of head markedly concave...	(REGALECIDAE) *Regalecus pacificus.*
Length over 30 times height; lateral line descending to within ⅛ of height of body from ventral surface; ventrals, if present, represented by a single filament; eye large; teeth on vomer and lower jaw; maxillary plate longer than deep; upper profile of head convex	(AGROSTICHTHYIDAE) *Agrostichthys parkeri.*
Length about 5 to 8 times height; lateral line traversing middle of sides; ventrals with 5 rays, small; eye large, nearer lower than upper profile; teeth on jaws, but none on vomer; maxillary plate much longer than deep; upper profile of head sloping obliquely forward, overhanging the snout ...	(LOPHOTIDAE) *Regilophotes guntheri.*

The Ribbon Fishes of Australia and New Zealand may thus be listed:—

N.Z. species (*fide* Phillips, 1927).	Australian species (*fide* McCulloch, 1929).	Here recognised as—	Vernacular names.
Regalecus pacificus .... *Regalecus argenteus* .... *Regalecus glesne*	*Regalecus glesne* ...	*Regalecus pacificus*	Oar Fish or King of the Herrings.
Agrostichthys parkeri	(Not known from Australia.)	*Agrostichthys parkeri.*	Streamer Fish.
Trachipterus trachypterus .... *Trachipterus jacksoniensis*	*Trachipterus jacksonensis.*	*Trachipterus arawatae.*	Southern Ribbon Fish or Deal-fish.
(*Lophotes cepedianus*, including *L. fiskii* Auct. was recorded by Waite but omitted by Phillipps.)	*Lophotes guntheri*... *Lophotes cristatus*...	*Regilophotes guntheri.*	Crested Bandfish or Unicorn Ribbon Fish.

Family **APOGONIDAE.**

Genus **Adenapogon** McCulloch, 1921.

Neoscopelus Castelnau, Vict. Offic. Rec. Philad. Exhib., 1875, p. 46. Haplotype, *Scopelus* (*Neoscopelus*) *cephalotes* Castelnau, from Adelaide. Name preoccupied by *Neoscopelus* Johnson, 1863, a genus of Myctophid fishes.

Adenapogon McCulloch, Rec. Austr. Mus. xiii, April 12th, 1921, p. 132. Orthotype, *Apogon roseigaster* Ogilby, 1886, from Parramatta River, New South Wales.

[46] Phillipps, Proc. Zool. Soc. Lond. 1924, ii, July, 1924, p. 539.

I had suspected that Castelnau's genus *Neoscopelus* might not have been a Myctophid because no photophores were mentioned in the original description. Dr. A. Vedel Taning, of Copenhagen, has confirmed this by kindly giving me a drawing of the type of *Scopelus* (*Neoscopelus*) *cephalotes* Castelnau in the Paris Museum. This clearly indicates that *Neoscopelus* is an Apogonid fish closely allied to *Adenapogon woodi* McCulloch.[46]

The characters given in McCulloch's key show that this species is quite distinct from *Apogon roseigaster*, the genotype of *Adenapogon*, so I make *A. woodi* the genotype of a new subgenus.

Scopelapogon subg. nov.

Orthotype, *Adenapogon* (*Scopelapogon*) *woodi* McCulloch.

Differs from typical *Adenapogon* in having more slender body, fewer dorsal and anal fin rays, shorter pectorals, and palatines with teeth.

Scopelapogon also replaces *Neoscopelus* Castelnau, preocc.

Adenapogon (Scopelapogon) cephalotes (Castelnau).

(Figure 3.)

Scopelus cephalotes Castelnau, Vict. Offic. Rec. Philad. Exhib., 1875, p. 46, Adelaide. Type in Museum d'Histoire Naturelle, Paris. *Id.* Macleay, Proc. Linn. Soc. N.S. Wales, vi, Sept. 12, 1881, p. 224.

Myctophum cephalotes Waite, Rec. S. Austr. Mus., ii, 1921, p. 45; Fish. S. Austr., 1923, p. 65. *Id.* McCulloch, Austr. Mus. Mem., v, 1929, p. 80.

I am indebted to Dr. A. V. Taning for the accompanying figure of the holotype of this puzzling species, which seems to differ from *A. woodi* in having a narrower maxillary and longer pectoral fins. Written on the drawing are the following data:—"D1 : vi; D2 : i, 8; A., ii, 8; P : 12?; V : 6?; C: 5 + 8 + 8 + 5. Length excl. C. 33 mm. (incl. def. C. 38 mm.)." *Loc.* Adelaide, South Australia (fide Castelnau).

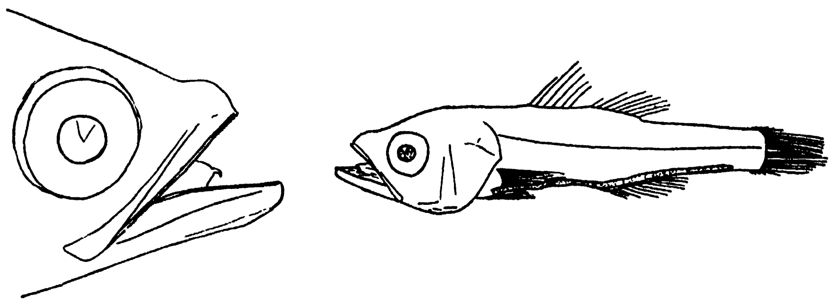

Figure 3.

Adenapogon (*Scopelapogon*) *cephalotes* (Castelnau). Holotype of *Scopelus cephalotes* Castelnau, 33 mm. standard length, from Adelaide, South Australia. Specimen in Museum d'Histoire Naturelle, Paris. Dr. A. V. Taning *del.*

[46] McCulloch, Rec. Austr. Mus. xiii, April 12, 1921, p. 134, pl. xxi, fig. 3. Rose Bay, Port Jackson, N.S.W. Types in Austr. Museum.

Dr. Taning (*in lit.*, Feb., 1933) asks me to mention that Professor L. Roule kindly lent him Castelnau's specimen in the Museum d'Histoire Naturelle, Paris, and that it was deemed necessary to go to me as a specialist of the area in question.

Family **EPINEPHELIDAE.**

Genus **Variola** Swainson, 1839.

Variola louti (Bonnaterre).

Perca louti Bonnaterre, Tabl. Encyl. Meth., Ichth., 1788, p. 133. *Ex* Forskaal, 1775, non-binomial. Red Sea.

Variola louti Fowler and Bean, Bull. U.S. Nat. Mus. 100, x, 1930, p. 203 (references and synonymy).

A fine specimen (No. IA. 5006) was caught at North-west Islet, Queensland, 26th May, 1931, where I made the following colour notes from the fresh fish.

General colour of body and fins rich dark reddish-brown, darkest on the back and becoming reddish-orange on lower part of head and body. Nearly every scale has a dark brownish centre. The ground colour is overlaid by prominent spots of various sizes. Most of them are crimson lake, but some are lilac or purple, and those on the sides of the head and body are milky and each tend to form zig-zag markings. Iris brilliant orange-red; eyelid coloured like rest of head; pupil black with a bright yellow ring shading into the orange-red of the iris.

Posterior dorsal and anal rays, tips of anterior dorsal membranes, and ventral rays bright canary yellow, as are also a crescentic area at the end of the middle caudal rays and a broad margin of each pectoral fin. Interior of mouth white.

New record for Australia.

Family **LETHRINIDAE.**

Genus **Lethrinus** Cuvier, 1829.

Lethrinus perselectus sp. nov.

D. X/9; A., iii/8; P. 13; V. i/5; C. 15. L. Lat. 48. L. tr. 6/1/16.

Head (95 mm.) 3, depth (106) 2.6 in standard length (285). Eye (19) 5, interorbital (25) 3.8, snout (48) nearly 2, preorbital (36) 2.6 in head. Pectoral (85) 3.4, third dorsal spine (30) and depth of caudal peduncle (30) 9.5 in standard length.

Head pointed, its upper profile evenly declivous, the lower jaw the longer. Four or five rows of scales across the operculum, rest of head naked. Mouth extending to vertical of posterior nostrils. A median concavity over the premaxillary processes. Teeth in a single row in each jaw; four canines anteriorly, those of the upper jaw the largest; posterior teeth blunt and peglike, almost molariform. All opercles entire. Temples with weak flutings before the body scales.

Depth of body greater than length of head. Ten or eleven predorsal scales. Lateral line following the well-rounded curve of the back. Exposed surfaces of scales longitudinally grained, the margins irregular in outline. Five rows of scales above lateral line. Third dorsal spine and sixth dorsal ray longest, but not produced. Third anal spine longer than second. Base of soft anal longer than the height of that fin. Low sheaths of small scales on dorsal and anal fins posteriorly. Pectorals and ventrals pointed, the latter reaching vent. Caudal emarginate, its rays all much shorter than head.

Ground colour, when fresh, oyster grey, with rows of milky blue spots which coalesce to form stripes on the flanks. Iris bright yellow with small brown blotches; pupil of eye black. Head greyish, tinged with yellow; white below and dirty whitish on interorbital and occiput. A short lilac-blue stripe before the eye, a long curved oblique similar stripe across the cheek preceded by two shorter ones parallel to it and a small lilac bar on the preopercular angle. Interior of mouth orange. Some light orange along margins of opercles and upper part of maxillary. Dorsal olivaceous, with some suffuse pearly marks proximally and with the distal margin of spines and membranes orange yellow. In the soft dorsal fin the distal yellowish tone encroaches upon the milky basal marks. Anal similar to soft dorsal but with the pearly marks less pronounced. Pectoral hyaline, with a lilac streak along the uppermost ray. Axil plain. Ventrals smoky, with a band of bluish-grey anteriorly. Caudal dirty yellowish, with milk spots near the centre and with the edges of the upper and lower lobes brighter yellow. No black lateral blotch or crossbands on body.

Described from the holotype, a specimen measuring 13 inches in length to end of middle caudal rays. Austr. Mus. regd. No. IA. 5011.

Loc., North-west Islet, Capricorn Group, Queensland; Coll. G. P. Whitley, May, 1931.

This species has been called *Lethrinus opercularis* Cuv. and Val. by authors who have recorded that Cingalese species from Queensland and New South Wales, but the Australian form differs in coloration.

Family **LEIOGNATHIDAE.**

Genus **Equula** Cuvier, 1816.

Equula daura Cuvier.

"Dacer karah" Russell, Fish. Vizag. 1803, p. 51, pl. lxv, in genus *Zeus*. Vizagapatam, India.

Equula daura Cuvier, Règne Anim. ed. 2, ii, April, 1829, p. 212. Based on Russell, pl. 65, Vizagapatam. *Id.* Cantor, Journ. Asiat. Soc. Bengal, xviii, 1850, p. 1132; Cat. Malay. Fish. 1850, p. 150. *Id.* Günther, Cat. Fish. Brit. Mus., ii, 1860, p. 502. *Id.* Day, Fish. Malabar, 1865, p. 105. *Id,* Schmeltz, Mus. Godef. Cat., v, 1874, p. 27. *Id.* Day, Fish. India, 1876, p. 240, pl. lii, fig. 4 (Madras specimen figured).

Equula dacer Cuvier and Valenciennes, Hist. Nat. Poiss., x, Sept., 1835, p. 83. Based on Russell, pl. 65. Vizagapatam. *Id.* Bleeker, Nat. Tijdschr. Ned. Ind., iii, 1852, pp. 53 and 57 (Singapore). *Id.* Bleeker, Act. Soc. Reg. Sci. Ind. Ned., vi, 1859, enumerat., p. 58.

Equula brevirostris Bleeker, Nat. and Geneesk. Arch. Ned. Ind., ii, 1845, p. 518, and Verh. Bat. Gen. xxii, 1849, p. 5; xxiii, 1850, p. 9; and xxiv, 1852, p. 81 (*fide* Weber and Beaufort, Fish. Indo-Austr. Archip., i, 1911). Not *Equula brevirostris* Cuv. and Val., 1835.

Leiognathus daura Jordan and Starks, Ann. Carneg. Mus., xi, 1917, p. 444.

D. viii/16; A. iii/14; L. lat. *circa* 65. Head (29 mm.) 3.4 and depth (49.5) 2 in standard length (99). Second dorsal spine 21 mm. and second anal spine 14 mm. A row of bristle-like teeth in each jaw. Supraorbital smooth. Antorbital spines very small. Lower preopercular margin weakly serrated. Breast and thorax naked. Lateral line complete. A large black blotch on spinous dorsal and a dusky patch on anterior portion of snout.

One specimen (Austr. Mus. regd. no. I. 64) from Madras, India, purchased from Dr. Francis Day.

This species, with more than 60 scales in lateral line, black blotch on dorsal, and smooth supraorbital, may deserve subgeneric differentiation from true *Equula*.

Genus **Secutor** Gistel, 1848.

Secutor ruconius (Hamilton-Buchanan).

Chanda ruconius Hamilton-Buchanan, Fish. Ganges, April, 1822, pp. 106 and 371, pl. xii, fig. 35. Mouth of the Ganges, India. *Id.* Hora, Mem. Ind. Mus., ix, 4, Nov., 1929, p. 86, no. 73.

Equula ruconius Cuvier, Règne Anim. ed. 2, ii, April, 1829, p. 212. *Id.* Cuvier and Valenciennes, Hist. Nat. Poiss., x, Sept., 1835, p. 79. *Id.* Bleeker, Verh. Bat. Genootsch., xxv, 1853, Faun. Beng. Hindostan, p. 96 (Hooghly River, Calcutta), and as *E. ruconii* in synonymy. *Id.* Day, Rept. Freshw. Fish. India and Burma, 1873, p. cclii (large rivers of lower Bengal and Burma). *Id.* Day, Fish. India, 1876, pp. 238 and 242, pl. li, c, fig. 4 (Madras specimen figured). Not *Equula ruconius* Day, Proc. Zool. Soc., Lond., 1869, p. 302, which is probably *Equula coma* Cuvier.

Chanda (Ambassis) ruconius McClelland, Calc. Journ. Nat. Hist., no. 8, 1842, p. 586; and as *Ambassis ruconius* on p. 574.

Equula interrupta Cuvier and Valenciennes, Hist. Nat. Poiss., x, Sept., 1835, p. 102. No locality (probably Pondicherry, India). *Id.* Günther, Cat. Fish. Brit. Mus., ii, 1860, p. 505 (not Australian record which is perhaps *Secutor profundus*). *Id.* Kner, Novara Exped. Zool., i, Fische, 1865, p. 169 (Java). *Id.* Pohl, Mus. Godef. Cat., ix, May, 1884, p. 32 (E. Indies). *Id.* Weber, Fische Siboga Exped., 1913, p. 269.

Equula ruconia Jordan and Seale, Bull. U.S. Bur. Fish., xxvi, 1907, p. 15 (Philippine Is.).

Leiognathus interruptus Bleeker, Ned. Tijdschr. Dierk., ii, 1865, p. 286 (Amboina).

Deveximentum ruconius Fowler, Copeia 58, 1918, p. 63 (Philippine Is.).

A specimen of this species in the Australian Museum (no. B. 8134) was purchased from Dr. Francis Day and came from Madras, India. It is 52 mm. in standard length or 2½ inches in total length and differs from the type of *Secutor profundus* (De Vis) as follows:—

Head (14.5 mm.) 3.5 and depth (32) 1.6 in length from tip of snout to hypural joint (52). Eye (6) equal to interorbital (6) and much greater than snout (3.5) and postorbital portion of head (4.8). Second dorsal spine (8) 1.8,

and second anal spine (6) 2.4 in head. Anterior nostrils very small, almost slit-like; posterior nostrils much enlarged, pyriform. Lower preopercular margin with more serrations. Supraorbital strongly serrated. Teeth minute, erect. Lower caudal lobe longer than upper and subequal to head in length. A black blotch on dorsal, an oblique black streak bordering the anterior margin of the cheek, and a series of vertical greyish bars, some of them dumb-bell shaped or broken up into spots, on upper part of sides. This specimen differs at sight from De Vis' species in being more evenly oval in outline, in having larger eye, and in the form of the nostrils; apparently it also differs in coloration.

Whilst this specimen agrees with Day's account in the "Fishes of India" it is not so deep as the fish figured in Hamilton-Buchanan's work, the text of which is not available to me, and it seems possible that two allied species may have been confused under the name *ruconius*. The solution of this problem I would prefer to leave to the Indian ichthyologists.

A Madras specimen of *Secutor insidiator,* compared with the specimen of *S. ruconius* noted above, has slenderer body, smaller nostrils, lateral line extending to below posterior dorsal rays, and a black blotch on spinous dorsal fin.

Australian specimens identified as *Equula interrupta* Cuv. and Val. may be *Secutor profundus* (De Vis) or a subspecies thereof.

Family **ETELIDAE.**

Ulapiscis gen. nov.

Orthotype, *Ulapiscis kennedyi,* sp. nov.

Head rather pointed, with chin in advance of snout and eyes large. Nape scarcely keeled and occipital crest not intruding upon the interorbital space which is flat with scarcely noticeable ridges. Cranium solid, not cavernous. Cheeks, opercles, and temples scaly; the broad preopercular margin and rest of head naked. No opercular spines or serrations. Venules on preopercular margin and preorbital. Maxillary not very broad, naked, without distinct supplemental bone, largely sheathed by preorbital, and reaching backward to below middle of eye. Teeth villiform, in narrow bands on jaws, absent from vomer and palatines, but forming a prominent patch on each side above and below the pharynx, where the teeth are largest. No canines. Tongue toothless, bluntly rounded, and but a short distance in advance of the first of the sixteen long narrow gill-rakers on the anterior branchial arch. Seven branchiostegal rays, the membranes united in advance of the anteriorly bifurcated isthmus.

Depth one-third of standard length; body fusiform, covered with cycloid scales which extend onto caudal rays and bases of pectoral rays but leave the other fins naked. Lateral line continuous, with 70 or more scales, almost parallel to curve of back and ceasing on middle of caudal fin. Scales above lateral line parallel with it and in horizontal rows below.

Dorsals united without notch, the first of ten spines, the third of which is longest; last dorsal ray much produced. Anal with three spines and a produced posterior ray. Pectorals somewhat shorter than head, reaching vertical of vent but not of anal origin. Ventrals shorter than pectorals, but, like them, pointed. Caudal forked, the lobes subequal and not filiform. Coloration plain.

This new genus comes nearest to *Ulaula* in Jordan, Evermann, Tanaka's key,[47] but differs in having toothless palate, shorter pectorals, fewer scales and gill-rakers and deeper body.

[47] Jordan, Evermann, and Tanaka, Proc. Calif. Acad. Sci. (4) xvi, 1927, p. 666.

Ulapiscis kennedyi sp. nov.

(Plate xi, fig. 2.)

Br. 7. D. x/11; A. iii/8; P. 16; V. i/5; C. 15. L. lat. *circa* 70. L. tr. 8/1/18.

Head (84 mm.) 3.1, depth (86) 3 in standard length (265) Eye (23), interorbital (26), snout (27) and depth of caudal peduncle (25) subequal and from 3 to 3.6 in head. Preorbital (6) 3.8, and topmost gillraker of lower part of first arch (15) 1.5 in eye. Pectoral, 71.5 mm.; ventral, 49; and lower caudal lobe, 79.

General characters as described for the genus.

Colour in alcohol, dull greyish, with the borders of the scales russet and naked parts of head dark brown. Dorsal fins brownish grey with some yellowish near the bases of the spines. Anal yellow with a brown base. Pectorals and ventrals largely yellowish. No conspicuous colour-markings.

Described and figured from the unique holotype of the species, a specimen 265 mm. in standard length or 1 foot 1½ inches from chin to vertical of caudal tips. Australian Museum regd. No. IA. 5534.

Loc.—Ellice Islands, Oceania.

Named in honour of Mr. Donald G. Kennedy, who collected this and many other species of fishes and other animals in the Ellice Group for the Australian Museum.

Family AMPHACANTHIDAE.

Genus **Lo** Seale, 1906.

Lo Seale, Occas. Pap. Bern. Bish. Mus., iv, 1 (Regd. Aust. Mus. Nov. 7), 1906, p. 71, Orthotype, "*Siganus vulpinus* Günther." *Id.* Jordan and Seale, Bull. U.S. Bur. Fish., xxv, 1905 (Dec. 15, 1906), p. 360, Orthotype, *Amphacanthus vulpinus* Schlegel and Müller.

Lo vulpinus (Schlegel and Müller).

Amphacanthus vulpinus Schlegel and Müller, Verhand. Nat. Ges. Nederl. overz. bezitt., Zool. (Pisces), 1844, p. 12, Seas of the Moluccas and of Celebes. *Id.* Schlegel, Bijds. tot. d. Dierk, i., 1852, p. 38 (*fide* Carus and Engelmann). *Id.* Weber, Fische Siboga Exped., 1913, p. 330 (East Indies and New Guinea).

Teuthis tubulosa Gray, Cat. Fish. coll. Gronow Brit. Mus. (pref. Feb. 12), 1854, p. 142, "Habitat in Mari Indico" Type in British Museum.

Teuthis vulpina Günther, Cat. Fish. Brit. Mus., iii, July, 1861, p. 324; Journ. Mus. Godeff, ii (Fische d. Südsee, i), 1873, p. 91 (Solomon and Pelew Islands).

Lo vulpinus Seale, Occas. Pap. Bern. Bish. Mus., iv, 1, 1906, p. 71, fig. 19; Jordan and Seale, Bull. U.S. Bur. Fish., xxv, 1906, p. 361, fig. 67 (Alu, Solomon Is.). *Id.* Herre and Montalban, Philip. Journ. Sci., xxxv, 2, 1928, p. 182, pl. vi (Philippine Islands).

? *Lo unimaculatus* Evermann and Seale, Bull. U.S. Bur. Fish. xxvi, 1906 (January 11, 1907), p. 98, fig. 19, Bacon, Philippines.

Siganus vulpinus Fowler and Bean, Bull. U.S. Nat. Mus. 100, viii, 1929, p. 332 (East Indies and Philippines—ref. and syn.).

This genus and species may now be added to the Australian List, as my colleague, Mr. Frank A. McNeill, collected two fine specimens at Hayman Island, Queensland, in January, 1933. Austr. Mus. regd. nos. IA. 5657-5658.

Lo unimaculatus from the Philippines has a more slender body and a black lateral spot, and may be a distinct species.

Family **LUTJANIDAE.**

Genus **Caesio** Lacépède, 1802.

Caesio chrysozonus translimitanus, subsp. nov.

Caesio chrysozona Cuvier and Valenciennes, Hist. Nat. Poiss., vi., Sept., 1830, p. 440. *Ex* Kuhl and van Hasselt MS. East Indies.

Caesio chrysozonus Fowler, Bull. U.S. Nat. Mus. 100, xi., 1931, p. 212 (refs. and syn.).

This species was recorded from Moreton Bay by Ogilby, but it may now be added to the New South Wales list, as I have received through Mr. D. G. Stead a drawing and description of a fish caught at Byron Bay which is readily identified as *C. chrysozona,* though it differs from the original type in coloration and is evidently subspecifically distinct. The Queensland and New South Wales form may therefore be named *Caesio chrysozonus translimitanus.* The description of the Byron Bay specimen reads:

> About 12 inches long. Thick body, resembling Mackerel, with two golden stripes along each side about ⅜ inch wide, the dorsal bands joining on commencement of dorsal fin and at caudal fin. A small black streak down each side running from opercle to fork of tail. Small mouth, and teeth small and close. Large eyes with red rings, also head, gills, and tail lobe tinted red; end of tail lobes black. Back bluish with silvery tint on belly. Small diamond scales.—W. B. Jackson, Byron Bay, May 18, 1914.

Specimens of this species are in the Australian Museum from Holbourne Island, off Port Denison (E. H. Rainford) and between 17 deg. and 19 deg. S. Lat., Queensland (W. E. J. Paradice). Also from Pitt Bay (A. Goldie) and Port Moresby (E. J. Cairn), in Papua. The type of the subspecies is the Moreton Bay specimen recorded by Ogilby.

Family **KURTIDAE.**

Genus **Kurtus** Bloch, 1786.

Kurtus Bloch, Nat. ausl. Fische, ii., 1786, p. 121; Ichtyologie, iii, 5, 1787, p. 98. Haplotype *K. indicus* Bloch, spelt *Kyrtus indicus* on pl. clxix.

Bossus Wilkes, Encycl. Londin., Jan. 7, 1799, plate of *Kyrtus indicus* Bloch, genotype by present designation.

Cyrtus Agassiz, Nomencl. Zool., 1846, Index Univ., p. 115. Emend. pro *Kurtus* and *Kyrtus* Bloch. Preoccupied by *Cyrtus* Latreille, 1796, Diptera = *Curtus* Dumeril, 1823; not *Curtos* Motschulsky, 1845 = *Cyrtus* Agassiz, 1846, Coleoptera.

Curtus Sherborn, Index. Anim. 1902, p. 507. Emend. Pro. *Kurtus* and *Kyrtus* Bloch. Preoccupied by *Curtus* Dumeril, 1823, Diptera, *vide supra.*

The "Encyclopaedia Londinensis," published in 24 volumes between 1796 and 1829, is a rare work in which some new names have been given to fishes, apparently by John Wilkes, whose species do not seem to have been recorded or recognised.

I have only seen one or two extracts from this Encyclopaedia, so am only now able to record a few synonyms, but hope that some ichthologist more favourably situated may later collect the fish names and establish their true status. The new names I have noted are as follows. Owing to the obscure manner of their introduction, they have found no place in Sherborn's "Index Animalium."

(1) *Bossus* Wilkes, 1799, is a synonym of *Kurtus* Bloch, 1786, as noticed above.
(2) *Chaetodon trivinculum* Wilkes, Encycl. Lond., Sept. 21, 1800, p. 67, Chaetodon, pl., iii, fig. 1, is a synonym of *Platax pinnatus* (Linné).
(3) *Chaetodon perca* Wilkes, *ibid,* p. 67, pl. iii, fig. 2, equals *Tetradrachmum aruanum* (Linné).

The type locality of these species is East Indies, though Arabia is included in their range.

Whilst on the subject of Encyclopaedias, I may state that, like Sherborn, I have searched in vain for the genus *Thunnus* South in the Encycl. Metropolitana, 1845; the name *Thunnus* was used by Oken[48] in 1836 as an alternative for *Thynnus.* I therefore use *Albacora* Jordan, 1888, as the generic name for the tunny.

Family **SARDIDAE.**

Genus **Germo** Jordan, 1888.

Orcynus Cuvier, Règne Anim., ii, "1817," = Dec., 1816, p. 314. Logotype, *Scomber germo,* Lacépède, selected by Jordan, 1888. Misspelt *Orycnus* by Gill, Proc. Acad. Nat. Sci. Philad., 1862, p. 238, who did not intend it as a new generic name. Preoccupied by *Orcynus* Rafinesque, 1815, another genus of fishes = *Scomberoides* Lacépède.

Germo Jordan, Proc. Acad. Nat. Sci. Philad., August 7, 1888, p. 180, Tautotype, *Scomber germo* Lacépède.

Orcynus was published in 1816 so that Jordan and Gilbert's[49] selection of *Scomber thynnus* Linné as the genotype of *Orcynus* Cuvier, 1829, is invalid, as that species was not mentioned in the original 1816 definition.

Germo germon steadi, new subspecies.

(Plate xi, fig. 1.)

Scomber germon Lacépède, Hist. Nat. Poiss., ii, 1800, p. 598, and iii, 1802, p. 1, as *S. germo.* 27° S. Lat., 103° W. long., Pacific Ocean.

Thynnus pacificus Cuvier and Valenciennes, Hist. Nat. Poiss., viii, "1831" = Jan., 1832, p. 133, based on *Scomber germon* Lacépède, Pacific Ocean.

Germo germo Stead, Proc. Linn. Soc. N.S. Wales, xxxi, 1906, p. 496; Add. Fish-Fauna, N.S.W. (Fish Dept., N.S.W.), 1907, p. 20; Ed. Fish, N.S.W., 1908, p. 95 (Port Macquarie, N.S.W.). ?*Id.* Jordan and Evermann, Occas. Pap. Calif. Acad. Sci., xii, 1926, p. 16, pl. iii, fig. 1. *Id.* Griffin, Tr. N.Z. Inst., lviii, 1927, p. 140, pl. xii, fig. 4 (Bay of Islands, etc., N.Z.).

Germo germon Waite, Rec. Canterb. Mus., ii, 1913, p. 19 (Turanganui River, New Zealand). *Id.* Thomson, N.Z. Journ. Sci. Tech., i, 1918, p. 6, fig. 3 (Cook Strait, N.Z.). *Id.* Phillipps, *ibid.,* iv, 1921, pp. 118 and 124. *Id.* Phillipps and Hodgkinson, *ibid.,* v, 1922, p. 93 (Auckland; 200 lb.).

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[48] Oken, Allgem. Naturg. x, 6, 1836, p. 193.
[49] Jordan and Gilbert. Bull. U.S. Nat. Mus. iii, 16, 1882, p. 428.

Thunnus germo McCulloch, Austr. Zool., ii, 1922, p. 105. *Id.* Kishinouye Journ. Coll. Agric. univ., Tokyo, viii, 1923, p. 434, figs. 20, 46, and 52.

The late A. R. McCulloch made the following notes upon a specimen examined by us jointly:—

"A specimen, approximately 965 mm. long from the tip of the snout to the end of the middle caudal rays, received from the Technological Museum, Sydney, 3rd April, 1925.

"Being eviscerated and severely cut about, it could not be cast, but the skin is preserved.

"This differs so greatly in many details from Jordan and Evermann's description,[50] and the original figure of Schlegel's in 'Fauna Japonica' that I cannot satisfactorily identify it as *Germo germo.* The maxillary reaches a little further than the vertical of the anterior margin of the eye, the membranous edges of the preoperculum and upper operculum are not denticulate; and the vomer is apparently toothless; the pectoral is very much longer than as described by J. and E., and figured by Schlegel,[51] reaching far beyond the origin of the anal to a vertical beyond the second dorsal finlet (it is 435 mm. long and therefore half a head-length longer than the head). There are some slight differences in the fin-counts (but it must be noted that J. and E. described seven anal finlets, but figured eight). The anal is 2½ in the head instead of 3.

"The colour has entirely gone, except in the finlets, which are bright yellow with black, sub-marginal lines and white borders. Flesh very red. Thirteen dorsal spines. Measurements:

"Total length, from tip of snout to end of middle caudal rays—approximately 960 mm. Head, from tip of snout to hinder margin of operculum, 270. Pectoral fin, 435; eye, 54; snout, from *ocular* margin, 88; anterior dorsal ray, 120; interspace between first dorsal spine and second dorsal fin, approx. 253.

"Body deep, and sub-cylindrical, but too much damaged to measure.

"Anal, 111 mm.; ventral, 95; depth of caudal peduncle, 23; breadth of caudal peduncle, 31."

Lacépède mentions 8 or 9 finlets above and below in a series of over 20 specimens observed by Commerson, having D. xiv/12; A. 12; P. 35; V. 7; C. 30.

The Australian form has the following characters:—

D. xiii /14 + 8 finlets; A. 12 ? + 8 ? finlets (damaged); P. 35; V.i/5; C. about 17 + 18; L. lat. circa 200.

Head naked, crudely striated behind eye. Opercles entire. Interorbital roundly convex. Maxillary reaching to vertical of the anterior ocular margin. The eye is pyriform, narrowest anteriorly. A single series of small, spaced, pointed teeth in each jaw. Tongue rounded, free anteriorly. Most of the gill-arches and viscera have been removed, but there are 14 flattened gillrakers, rugose on their inner margins, on the lower limb of one branchial arch. Pseudobranchiae present.

Body with small imbricate scales which are largest on the scapular region and disappear before the pectoral base and behind the gill-opening. Very fine scales extend over the anal and soft dorsal fins. The last dorsal ray is smaller

[50] Jordan and Evermann, Bull. U.S. Fish. Comm. xxiii, July 29, 1905, p. 174, fig. 66.
[51] Temminck and Schlegel, Fauna Japon. Poiss. 1844, p. 97, pl. 1, as *Thynnus sibi*, a species with short pectorals from Japan.

than those preceding it and the first finlet is smaller than the others. Pectorals straplike, extending to about the vertical of the second dorsal finlet. Ventrals with the innermost rays somewhat telescoped. Caudal widely forked, its median rays strongly compressed and shielded by a scaly sheath. Caudal peduncle depressed, with a keel on each side.

Colour, in formalin, dark grey above, greenish on the scales, and brown on sides of head and thorax. Spinous dorsal and pectorals dusky. Soft dorsal, anal, and caudal greenish, with lighter margins. Broad light margins contrast with an inframarginal dusky area on the ventral fins and the dorsal and anal finlets.

Described and figured from the holotype of the subspecies, a specimen 38 inches long, from New South Wales. Austr. Mus. regd. No. IA. 2457.

The head and fins of another specimen are also preserved from Port Macquarie, N.S. Wales. Regd. No. IA 47. This is the specimen recorded by Mr. David G. Stead, after whom the subspecies is named, and who has been instrumental in presenting to the Museum several large and valuable collections.

Loc.—New South Wales, where it attains a length of 4 feet.

The vernacular name of this fish is the Longfinned Albacore. It may be of historical interest to recall that Allan Cunningham[52] mentioned "Albicore" [? this species] from north-western Australia, February 21, 1818, and a small striped tunny[53] is called Albacore from the Gulf of Papua in de Prado's MS., 1606. Albicores were seen when Cook[54] was passing through Whitsunday Passage, Queensland, in which State the name albacore is now gaining favour for the Turrum (*Turrum emburyi*).

Family **ISTIOPHORIDAE.**

Genus **Istiophorus** Lacépède, 1802.

Istiophorus ludibundus sp. nov.

Istiophorus gladius McCulloch, Rec. Austr. Mus., xiii, 4, April 12, 1921, p. 137, pl. xxiv, fig. 1. Port Stephens, N.S. Wales.

A sailfish from New South Wales was described and figured by McCulloch as *Istiophorus gladius* (Broussonet), but that name is apparently an invention of ichthyologists, as according to Sherborn (*in lit.*) Broussonet described a species of sailfish in the genus *Scomber* without giving it a trivial name. I am unfortunately unable to consult Broussonet's work,[55] but *Histiophorus indicus* Cuvier and Valenciennes[56] is based on Broussonet's fish, which is said to have been noted by Banks in "La mer des Indes," so may be regarded as the typical form. I have, however, discovered no mention of a sailfish in Hooker's edition (1896) of Banks' Journal, or in the original MS. of Banks in the Mitchell Library, Sydney, but his type may have come from Sumatra.

On comparing McCulloch's account and figure with those of Cuvier and Valenciennes, sufficient differences are noticeable to justify the renaming of the Australian fish, which has the following distinguishing characters.

D. 46/7; A. 12/6; P. 18; V. i/2.

[52] Lee, Early Explorers in Australia, 1925, p. 332.
[53] Stevens, New Light on the Discovery of Australia (Hakluyt Soc. (2) lxiv), 1930, p. 1
[54] Hist. Rec. N.S. Wales 1, 1893, pp. 126, 199 and 257.
[55] Broussonet, Mem. Acad. Sci. 1786 or 1788, p. 484, pl. x. La mer des Indes (Banks).
[56] Cuvier and Valenciennes, Hist. Nat. Poiss. viii, 1831, Jan., 1832, p. 293, pl. ccxxix.

Height more than 9 in total length. Head about 3½ in same. Lower jaw about half the length of the upper which is 5 in length. Elevation of dorsal fin over pectorals equal to height of body. No triangular light mark on base of dorsal.

Istiophorus ludibundus also appears to differ in being of smaller size and having more numerous scales and less extensive pectoral, ventral, and anal fins.

Family **TRICHIURIDAE.**

Assurger gen. nov.

Orthotype, *Evoxymetopon anzac* Alexander[57] = *Assurger alexanderi* nom. emend., as Anzac is not permissible.

Body extremely elongate, its height 28 in total length. Head 12 in same. More than one hundred dorsal rays, the first apparently not produced. Upper profile of head oblique, but not so steep as in true *Evoxymetopon*,[58] which has body 12 or 13 in total length and head about 8, besides large eye and fewer dorsal rays.

Family **APLODACTYLIDAE.**

Genus **Crinodus** Gill, 1862.

Crinodus Gill, Proc. Acad. Nat. Sci. Philad., xiv, May, 1862, pp. 110 and 112. Haplotype *Haplodactylus lophodon* Günther.

Parhaplodactylus Thominot, Bull Soc. Philom. (7), vii, 1883, p. 140. Logotype, *Haplodactylus lophodon* Günther (*fide* Jordan, Gen. Fish., iv, Aug. 15, 1920, p. 426).

Differs from *Aplodactylus* in having no vomerine teeth, and five instead of six branchiostegals. Gill's definition includes uniserial mandibular teeth but these are really biserial as in *Aplodactylus*. This genus is monotypic, *Crinodus lophodon* being allied to, but not congeneric with *Haplodactylus schauinslandii* Steindachner from New Zealand and *H. etheridgii* Ogilby from Lord Howe Island.

Crinodus lophodon (Günther).

(Plate xiv, fig. 2.)

Haplodactylus lophodon Günther, Cat. Fish. Brit. Mus., i, pref., May 5, 1859, p. 435. Sydney, N.S. Wales. Type in British Museum. *Id.* Ogilby Cat. Fish., N.S.W., 1886, p. 18.

Aplodactylus lophodon Castelnau, Proc. Linn. Soc., N.S. Wales, iii, May, 1879, p. 350. *Id.* Stead, Ed. Fish., N.S.W., 1908, p. 72.

Aplodactylus obscurus Castelnau, Proc. Linn. Soc., N.S. Wales, iii, May, 1879, pp. 350 and 374. Sydney Markets.

Haplodactylus obscurus and *lophodon* Tenison-Woods, Fish. Fisher, N.S.W., 1882, p. 39.

(?) *Parhaplodactylus marmoratus* Thominot, Bull. Soc. Philom. (7), vii, 1883, p. 140, Australia (*fide* Zool. Rec.). Not seen.

[57] Alexander, Journ. Proc. Roy. Soc. W. Austr. ii, June, 1917, pp. xi and 104, pl. vii. Fremantle Western Australia.

[58] Gill, Proc. Acad. Nat. Sci. Philad, xv, 1863, pp. 225 and 228. *Ex* Poey MS. Orthotype, *E. taeniatus* Gill. from Cuba.

Parhaplodactylus lophodon Thominot, Bull. Soc. Philom. (7), vii, 1883, p. 140 (*fide* Zool Rec.).

Crinodus lophodon Gill, Proc. Acad. Nat. Sci. Philad., xiv, May, 1862, p. 112, *ex* Günther. *Id.* McCulloch, Austr. Zool, ii, 3, 1922, p. 93; Austr. Mus. Mem., v, 1929, p. 256.

This species, known as the Rock Cale or Cockatoo Fish, is common in New South Wales, but has not previously been figured. McCulloch noted in manuscript that "Castelnau relied chiefly upon the number of simple pectoral rays—seven instead of six—to distinguish his species (*obscurus*), but I find six right and seven left simple rays in the same specimen." Ramsay MS., notes:

". . . The general color is black or bluish-black with ashy-white mottlings. In some specimens, the mottlings form ashy bars. The fins are spotted with ashy. The simple pectoral rays vary in number from 6 to 8—both fins have not always the same number—but usually 6 on one side, 7 or 8 on the other. It is not a plentiful species, but specimens may be occasionally obtained throughout the months of August to December in the Sydney Markets."

Length, 18 inches.

The accompanying figure has been prepared from a fine specimen, 174 mm. in standard length, caught near Coogee, New South Wales, by Mr. F. A. McNeill. D. xvi/21; A. ii/7; P. 14 (6 simple); V. i/5; C. 7 + 6 = 13. Austr. Mus. regd. No. IA. 726.

Family **AMPHIPRIONIDAE.**

Genus **Amphiprion** Bloch and Schneider, 1801.

Amphiprion verweyi sp. nov.

A species of the group of *A. melanopus* and *A. mccullochi* found amongst sea-anemones on the Great Barrier Reef, Queensland, and differing in coloration.

Dorsal, pectoral and caudal fins orange (light yellowish in spirit); ventral and anal fins black. Opercular band usually extending to the dorsal surface of the neck, where it joins its fellow before the dorsal fin; it sometimes terminates a little below that point. Caudal fin truncate posteriorly, its lobes rounded.

The holotype was collected by me in an anemone at North-west Islet, Capricorn Group, Queensland, on May 25, 1931, when the colours were noted as—

"General colour of body dark brown, almost blackish, but becoming lighter on head, especially around chin. Ventrals and anal also very dark brown. Dorsals, caudal, and pectoral rich orange. Band on posterior part of head brilliant silvery, with a broad margin of bright peacock bluish-green. Iris dark brown; pupil dark, dull bluish."

Besides this specimen, there are many paratypes in the Australian Museum from Masthead Island, Green Island, and other Queensland localities.

Named in honour of Dr. J. Verwey, who has studied the association of *Amphiprion* and the sea-anemones in the Bay of Batavia.

[59] Whitley, Mem. Qld. Mus. ix, 3, 1929, pp. 210-213 and 232-234.

Genus **Phalerebus** Whitley, 1929.

Phalerebus Whitley Mem. Qld. Mus., ix, 1929, p. 216. Orthotype, *Prochilus akallopisos* Bleeker.

Phalerebus akallopisos (Bleeker).

Amphiprion akallopisos Bleeker, Nat. Tijdschr. Ned. Ind., iv, 1853, p. 281, Priaman.

Prochilus akallopisos Bleeker, Natuurk. Verh. Holl. Maatsch. Wetensch. (3) ii, 6, 1877, pp. 22 and 35; Atlas Ichth., ix, 1877, pl. cccc, fig. 3 (East Indies).

Two specimens (IA. 5552-3) from Soraken, Bougainville Group, Solomon Islands, from Taronga Park Aquarium.

Family **LABRIDAE.**

Genus **Pseudolabrus** Bleeker, 1862.

Labroides Richardson, Ann. Mag. Nat. Hist., xi, June 1, 1843, p. 426. Haplotype *L. asellinus* Richardson *ex* Solander MS. *Nomen nudum.* Not *Labroides* Bleeker, 1851, another genus of fishes.

Pseudolabrus Bleeker, Proc. Zool. Soc. Lond., 1861 (April 7, 1862), p. 413 (6 of reprint). *Id.* Bleeker, Versl. Akad. Amsterdam, xiii, 1862, p. 101. Orthotype, *Labrus rubiginosus* Temminck and Schlegel, 1845 (preocc. by Risso 1826) = *Labrus japonicus* Houttuyn, 1782; *fide* Jordan, Gen. Fish.

The New Zealand species of this genus were reviewed by Waite in 1911 but, as several early works on Neozelanic ichthyology are still not accessible to workers in that Dominion, I have revised the synonymy and nomenclature of two of the best known species hereunder. They are not strictly referable to *Pseudolabrus* and may be separated as

Lunolabrus subg. nov.

Orthotype, *Labrus miles* Bloch and Schneider, 1801.

This subgenus is readily distinguished from *Pseudolabrus* by the comparatively larger scales, which are in less than thirty transverse rows on the body. Cheek-scales in five or more rows. Profile of head convex. Three anal spines. In the type-species, the caudal is markedly lunate, not rounded as in *Pseudolabrus*, s. str.

Pseudolabrus (Lunolabrus) miles (Bloch and Schneider).

Labrus miles Bloch and Schneider, Syst. Ichth., 1801, p. 264. New Zealand (Cook).

Labrus coccineus Bloch and Schneider, Syst. Ichth., 1801, p. 264. *Ex* Forster MS. New Zealand. In synonymy, but *miles* has line-priority. *Id.* Forster. Descr. Anim. (ed. Lichtenstein), 1844, p. 131. South Island of New Zealand.

Julis rubiginosus Richardson, Trav. N. Zeal. (Dieffenbach), ii, Jan., 1843, p. 218, and Ann. Mag. Nat. Hist., xi, June 1, 1843, p. 425. *Ex Sparus rubiginosus.* Solander MS. Mattaruhow and Cape Kidnappers, New Zealand. *Id.* Bleeker. Verh. Akad. Amsterd., ii, 1855, p. 13. Not *Labrus rubiginosus* Risso, 1826, or Temminck and Schlegel, 1845.

Julis miles Richardson, Trav. N. Zeal. (Dieffenbach), ii, Jan., 1843, p. 218, and Rept. 12th meet. Brit. Assn. Adv. Sci., 1842 (late 1843), p. 24. *Ex Labrus coccineus* Forster MS. and *L. miles* Bloch and Schneider.

Julis prasiophthalmus Richardson, Trav. N. Zeal. (Dieffenbach), ii, Jan., 1843, p. 218. *Nomen nudum ex Sparus prasiophthalmus* Solander MS. N.Z.

Sparus prasiophthalmus Richardson, Trav. N. Zeal. (Dieffenbach), ii, Jan., 1843, p. 218, and Rept. 12th meet. Brit. Assn. Adv. Sci., 1842 (late 1843), p. 24. *Ex* Solander MS. New Zealand. "Has six obscure bands," etc.

Julis rubecula Richardson, Ann. Mag. Nat. Hist., xi, June 1, 1843, p. 423. *Ex Sparus rubecula* Solander MS. Ship Cove, Queen Charlotte Sound and Cape Kidnappers, New Zealand. *Id.* Bleeker, Verh. Akad. Amsterd., ii, 1855, p. 13. "New Holland" = New Zealand.

Sparus rubecula var. *pallidior* Richardson, Ann. Mag. Nat. Hist., xi, June 1, 1843, p. 424. *Ex* Solander MS. Cape Kidnappers, New Zealand.

Iulis miles Forster, Descr. Anim. (ed. Lichtenstein), 1844, p. 420. *Ex* Gray MS.

Labrichthys psittacula (non Richardson) and *rubiginosus* Hutton, Cat. Fish. N. Zeal., 1872, p. 43. Cook Strait, N.Z.

Labrichthys roseipunctata Hutton, Trans. N. Zeal. Inst., xii, May, 1880, p. 455. Dunedin, New Zealand. A small specimen with six longitudinal bands of yellowish pink; recalls *prasiophthalmus, supra.*

Pseudolabrus cossyphoides Steindachner, Denkschr. Akad. Wiss. Wein, lxx, 1901, p. 503, pl. ii, fig. 1, New Zealand. A specimen of 24.5 cm.

Pseudolabrus coccineus Waite, Rec. Canterb. Mus. i, 3, June, 1911, p. 224, pl. xlvi.

Pseudolabrus miles McCulloch, Rec. Austr. Mus., xiii, 1921, p. 136 (refs.). *Id.* Phillipps, N. Zeal. Journ. Sci. Tech., iv, 1921, pp. 116 and 124 (spawning and occurrence).

Labrichthys miles Rendahl, Saertryk Vidensk. Medd. Dansk. Foren, lxxxi, 1925, p. 3.

Julis rubecula, Sparus rubecula pallidior, and *Pseudolabrus cossyphoides,* which have been generally overlooked, should be added to the synonymy of this species. *Julis* or *Sparus prasiophthalmus* is apparently another synonym; it was briefly noticed as having six obscure bands, thereby recalling *roseipunctata.*

The Australian forms of this species have received the names *Labrus psittaculus* Richardson, 1840, and *Labrichthys mortonii* Johnston, 1885, from Tasmania, and *Labrichthys rubicunda* Macleay, 1881, from West Australia.

Pseudolabrus (Lunolabrus) celidotus (Bloch and Schneider).

Labrus celidotus Bloch and Schneider, Syst. Ichth. 1801, p. 265. *Ex* Forster MS. New Zealand (Cook). *Id.* Forster, Descr. Anim. (ed. Lichtenstein), 1844, p. 133. South Island of New Zealand. *Id.* Richardson, Zool. Voy. Erebus and Terror, Fish. 1846, p. 53, pl. xxxi, figs. 1-5.

Labrus poecilopleura Cuvier and Valenciennes, Hist. Nat. Poiss., xiii, "1839" = Dec. 1838, p. 95. New Zealand (Lesson and Garnot). *Id.* Jouan. Mem. Soc. Imp. Nat. Cherbourg, xiv, 1869, pp. 84 and 87.

Julis notatus Richardson, Trav. N. Zeal. (Dieffenbach), ii, Jan., 1843, p. 218. *Nomen nudum ex Sparus notatus* Solander MS. *Id.* Richardson, Ann. Mag. Nat. Hist., xi, June 1, 1843, p. 425. Tolaga Bay, New Zealand. *Id.* Richardson, Zool. Erebus and Terror, Fish., 1846, p. 53.

Julis celidotus Richardson, Trav. N. Zeal. (Dieffenbach), ii, Jan., 1843, p. 218; Rept. 12th meet. Brit. Assn. Adv. Sci., 1842 (late 1843), p. 24.

Sparus stellatus Richardson, Ann. Mag. Nat. Hist., xi, June 1, 1843, p. 426; Rept. 12th meet. Brit. Assn. Adv. Sci., 1842 (late 1843), p. 24. Totaeranue Cove [= Ship Cove, Queen Charlotte Sound] and Tolaga Bay, New Zealand. *Nomen nudum ex* Solander MS.

Labroides asellinus Richardson, Ann. Mag. Nat. Hist., xi, June 1, 1843, p. 426; Rept. 12th meet. Brit. Assn. Adv. Sci., 1842 (late 1843), p. 24. Totaeranue Cove and Tolaga Bay, New Zealand. *Nomen nudum* ex Solander MS.

Iulis celidotus Forster, Descr. Anim. (ed. Lichtenstein), 1844, p. 420. *Ex* Gray MS., New Zealand.

Labrichthys celidota Hutton, Cat. Fish. N. Zeal., 1872, p. 42. *Id.* Günther, Ann. Mag. Nat. Hist. (4), xvii, 1876, p. 398.

Pseudolabrus celidotus Waite, Rec. Canterb. Mus., i, 3, 1911, p. 224. *Id.* McCulloch, Rec. Austr. Mus., xiii, 1921, p. 136. *Id.* Phillipps, N. Zeal. Journ. Sci. Tech., iv, 3, 1921, p. 117 (spawning and occurrence).

Sparus stellatus and *Labroides asellinus* may be added to the synonymy of *Labrus celidotus*, as no descriptions or figures of these nominal forms have been published from Solander's manuscripts in England for the enlightenment of antipodean ichthyologists. The fishes upon which these names were based, being the first collected by white men in New Zealand, are of some historical interest, and it is unfortunate that Richardson should unwittingly have caused some confusion by supplying so many names for them in several almost contemporaneous publications which are now difficult to obtain.

Family **ELEOTRIDAE.**

Subfamily **Oxymetopontinae.**

Gignimentum gen. nov.

Orthotype, *Gignimentum penicillum*, sp. nov.

Form elongate; head acute, unarmed, with the mouth oblique and the lower jaw produced beyond the upper. No bony crests, barbels, or fringes on head. First dorsal fin with six spines. Soft dorsal and anal with less than fifteen rays. Ventral fins entirely separate, the rays i/4. Scales in about sixty transverse series on the body, cycloid anteriorly and ctenoid posteriorly; a few week scales on sides of head. About fifteen predorsal scales.

This generic definition is based on a specimen, described below, which was labelled "Oxymetopontinae" in the Museum collection but which differs from the Oxymetopontine genera, *Oxymetopon* Bleeker,[60] *Ptereleotris* Gill,[61] *Vireosa* Jordan

[60] Bleeker, Nat. Tijdschr. Ned. Ind. xxii, late 1860, pp. 249 and 258. Orthotype, *O. typus* Bleeker from " Timor-kupang in mari."

[61] Gill, Proc. Acad. Nat. Sci. Philad. 1863, p. 271, Orthotype, *Eleotris microlepis* Bleeker.

and Snyder[62] and *Orthostomus* Kner[63] = *Stomogobius* Whitley[64] in having much fewer dorsal rays. *Parioglossus* Regan[65] is distinguished by the form of the head and the naked breast. The elongate form, large ctenoid scales on the posterior part of the body, lack of barbels, and rounded caudal fin are noteworthy characters of *Gignimentum.*

Gignimentum penicillum sp. nov.

(Figure 4.)

D. vi/13; A. 13; P. 16; V. i/4; C. 14 branched rays. Sc. *circa* 60. About 15 predorsal scales. L. tr. 22 anteriorly, 9 on caudal peduncle.

Head, exclusive of lower jaw (6 mm.) 4.4, depth (4) subequal to greatest breadth and 6.6 in standard length (26.5). Eye (1.5) greater than interorbital (1) and slightly longer than snout, 4.3 in the maximum length of the head (6.5).

Head wedge-shaped, somewhat depressed, the lower jaw much in advance of the upper. Eyes fairly large, close to the jaws. Opercles entire. Some cycloid scales on cheeks and opercles. Gill-membranes united across isthmus. Seven branchiostegals. A row of mucous pores around the preopercular margin joins a series which passes over the top of the cheeks to the interorbital rows, which unite to form a median backwardly directed tube between the eyes. Four large nostrils, each protected by a flap. Mouth large, maxillary extending to below hinder half of eye. Several rows of distinct small canines in each jaw. Tongue somewhat spatuliform; notched anteriorly and raised posteriorly. Vomer toothless. Chin sulcate, without barbels. Cranium naked and smooth.

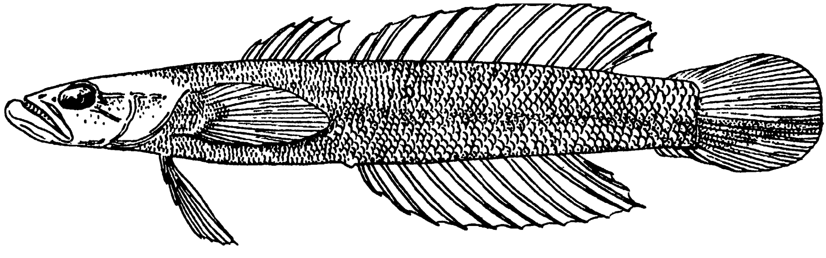

Figure 4.

Gignimentum penicillum Whitley. Holotype, 26.5 mm. standard length, from the New Hebrides. Austr. Mus. regd. No. IA.833. G. P. Whitley *del.*

Body elongate, rounded, covered with weak scales which extend on to breast, pectoral bases and temples, but not on the rays of the fins. They are small and cycloid anteriorly and enlarged and ctenoid towards the caudal peduncle. A genital papilla.

[62] Jordan and Snyder, Proc. U.S. Nat. Mus. xxiv, 1901, p. 38. Orthotype, *V. hanae.* J. and S. from off the coast of Japan.

[63] Kner, Sitzb. Akad. Wiss. Wien lviii, 1868, p. 29. Type, *O. amblyopinus* Kner. Preocc. by *Orthostoma* Ehrenberg, 1831, and *Orthostomum* Grube, 1840, Coelenterata.

[64] Whitley, Austr. Zool. vi, 1931, p. 334. Orthotype, *Orthostomus amblyopinus* Kner.

[65] Regan, Trans. Linn. Soc. Lond. (2), xv, Sept., 1912, p. 302. Haplotype, *P. taeniatus* Regan, from Aldabra, Indian Ocean.

Pectorals and ventrals rather long, in advance of the origin of the first dorsal which is separate from the second, whose origin is just opposite the vent. Last dorsal and anal rays divided. Caudal rounded, much shorter than head and a little shorter than pectorals. Ventrals entirely separate, each with five rays, the first unbranched and the penultimate longest.

General colour after long preservation in alcohol, fairly uniform brownish, the eyes blue. A dark brown oblique bar crossing the lower half of the caudal fin, is broadest on the bases of the rays, and tapers towards the tips of the median rays as in some species of the scaleless genus *Hetereleotris*.

Described and figured from the unique holotype of the species, a specimen 26.5 mm. in standard length or 1¼ inches overall. In superficial facies, this fish rather recalls the Trichonotidae.

Loc.—New Hebrides; collected by A. R. McCulloch. Austr. Mus. regd. No. IA. 833. The exact habitat is not recorded, but is perhaps Vila Harbour, where McCulloch collected fishes and other marine animals at night when they were attracted by the glare of the lights of H.M.S. "Pegasus."

Genus **Ptereleotris** Gill, 1863.

Ptereleotris playfairi sp. nov.

Eleotris microlepis Playfair, Fish., Zanzibar, 1866, p. 75, pl. ix, fig. 5. Zanzibar. Not *E. microlepis* Bleeker, Nat. Tijdschr. Ned. Ind., xi, 1856, p. 102, from Banda, East Indies.

D. vi/i, 27; A. i, 26-27. This species is distinguished by the form of the first dorsal fin, lower soft dorsal and anal fins, deep body and more truncate caudal fin from *Ptereleotris microlepis*. an Australian specimen of which was figured by McCulloch and Ogilby.[66]

Family **GOBIIDAE.**

Obtortiophagus gen. nov.

Orthotype, *Obtortiophagus koumansi*, sp. nov.

Head rounded, subcylindrical posteriorly, with minute papillae in rows on slightly raised ridges. Eyes sloping towards one another, separated by a narrow interorbital. No tentacles, crest, or spines on head nor barbels on the chin. No fleshy lobes on shoulder girdle. Snout broadly rounded; jaws subequal. Tongue rounded convexly. Bands of canine teeth in jaws; none on lips. Maxilla normal, not produced to preoperculum. Gill opening extending to below the level of the preoperculum, which is unarmed. No pit above opercle. Body opaque, robust, compressed, deep anteriorly, covered with ctenoid scales, which lose their toothed edges as they approach the nape and breast. Less than 50 transverse rows of scales between operculum and caudal fin. Pectoral base and anterior half of breast naked. Head naked, the body scales becoming slightly smaller and finally vanishing on nape at about the level of the preoperculum.

First dorsal with six slender spines, separate from the second, which, like the anal fin, is quite distinct from the lanceolate caudal. Upper pectoral rays not free. Ventrals infundibuliform, not adnate, the fifth rays longest. Coloration ornate, mostly brownish in spots or indistinct bands of varying tones, and with prominent blackish blotches on the sides.

[66] McCulloch and Ogilby, Rec. Austr. Mus. xii, 1919, p. 258, pl. xxxvii, fig. 1.

Though the united ventrals indicate this genus as Gobiid, it superficially resembles the Eleotrid genera *Amblygobius, Gergobius,* and *Calleleotris,* but has differently formed fins and larger scales. It is apparently nearer that perplexing group of gobies centred around *Callogobius, Doryptena, Gunnamatta,* and *Oxyurichthys,* which are made to appear vastly different from one another and closer to unrelated genera by the dichotomous keys so much in vogue. The shape of the head, teeth, and cycloid scales appear to distinguish *Macgregorella.* From the other genera *Obtortiophagus* may be easily distinguished by the combined characters defined above, and, though it approaches *Oxyurichthys,* has not the median naked ridge or crest on the nape and lacks the more elongate form of that genus. The Gobioid genera have recently been reviewed by Koumans, but it seems that many more new generic names will have to be proposd for various Indo-Pacific, Japanese, and Australian species before the group can be phylogenetically arranged in a natural classification. Zoogeographical distribution and ecological environment appear to play a large part in modifying the structure of these interesting little fishes which are found in shallow and deep water, salt and fresh, burrowing in mud or challenging currents, sheltering in coral, or even leaving the water altogether.

Obtortiophagus koumansi sp. nov.

(Plate xi, fig. 3.)

D. vi/11; A. 10; P. 17; V. 5; C. 13 branched rays. L. lat. 47, 11 to 13 longitudinal rows of body-scales between soft dorsal and anal on each side.

Head (15 mm.) 3.3, depth (12) 4.1 in standard length (50). Caudal peduncle (6) 2.1 in length of caudal, measured from hypural joint (13). Eye (3) equal to snout and 5 in head.

Head rounded, somewhat bulbous. Eyes superior, separated by a narrow interorbital depression. Temples naked. Scales behind head smaller than those on body. Mouth large, oblique, extending to below posterior half of eye. Jaws subequal, each with bands of small caniniform teeth. Vomer prominent but toothless. Tongue with a convex free margin, not notched. A row of well-marked papillae on each side of chin. Head crossed by several subvertical and subhorizontal ridges each bearing a row of small mucigerous papillae. Anterior nostrils with a broad flap, posterior ones subcircular with a raised anterior ridge.

Body elevated anteriorly and compressed, covered with strongly ctenoid scales. Vent large; a rather prominent genital papilla. Dorsal spines slender and somewhat produced, the longest (12.5 mm.) subequal to depth of body below it. There is no ventral spine, and the caudal is broadly lanceolate. Upper pectoral rays short and weak, but not separated from the others or silk-like; the longest pectoral rays are shorter than the head.

Remains of small crustacea and two minute gastropod shells, identified by Mr. Tom Iredale as *Obtortio* and *Bittium,* in the intestines.

General colour, in alcohol, light-brown, the dorsal and caudal fins yellowish. Face grey; eye bluish. A dark-brown horseshoe-shaped mark at origin of dorsal. Sides of head with dark brown spots which become larger inferiorly and form four dark bands across the throat. Base of pectoral with brown spots, formed from congregations of smaller groups of chromatophores, like those on the sides of the head. A dusky bar behind preoperculum. Sides crossed by four broad ill-defined bands of brown. A large black ocellus, edged with white, is

overlain by the pectoral fin; this is followed by three smaller dark brown spots along the middle of each side of the body, alternating with indistinct white marks, but not forming ocelli. Lower part of sides with about three irregular sub-horizontal rows of spaced milky spots. Breast and thorax whitish, crossed by four or five dark brown bands which meet below.

Dorsal fins yellowish, speckled with brown. Caudal yellowish, with a wash of brown on the lowermost rays. Ventrals and anal brownish, with ill-defined white blotches. Pectorals hyaline.

Described and figured from the holotype, 50 mm. in standard length or about 2¾ inches in total length. Austr. Mus. regd. No. IA. 2027.

Loc.—Hayman Island, Whitsunday Group, Queensland; collected in 1924 by Mr. E. H. Rainford, of Bowen.

At first I thought that this species might be *Gobius nigroocellatus* Günther[67] from Bowen, but Günther's description disagrees in so many respects that I have no option but to rename my specimen, especially as I have been unable to discover anything resembling it in literature.

Named in honour of Dr. Frederick Petrus Koumans, of Leiden, Holland, in appreciation of his "A Preliminary Revision of the Genera of the Gobioid Fishes with United Ventral Fins," published in 1931.

Whilst on the subject of gobies, I would remark upon a few Australian species. Authors have overlooked the fact that Palacky[68] recorded *Gobius cyclopterus* Cuv. and Val.[69] from Australia. The exact generic position of this fish is uncertain.

Gobiosoma guttulatum Macleay[70] is a *Scartelaos* near *S. viridis* (Ham.-Buch.), but *Gobius viridis* is preoccupied, according to Sherborn's Index Animalium, by *G. viridis* Otto.[71] The Australian form may be called *Scartelaos macrophthalmus* (Castelnau), a synonym according to McCulloch.[72] Waite[73] recorded this species from Western Australia.

Ellogobius, new genus.

Orthotype, *Gobius stigmaticus* De Vis[74] = *Ellogobius stigmaticus*.

The generic name, *Mugilogobius*, has been employed for two species of Australian Gobies which are not referable to that genus as nowadays restricted. Smitt[75] named "*Mugilogobius* n. subg. from India and Japan" as a *subgenus caelebs* of *Gobius*. Jordan's "Genera of Fishes" informs us that the logotype is *Ctenogobius abei* Jordan and Snyder.[76] It needs but a glance at the figure of Jordan and Snyder's species to show that the Australian "*Mugilogobius*" are very dissimilar, especially in form of body and fins and squamation, so a new name as above is necessary.

Vaimosa Jordan and Seale,[77] from mountain brooks of the South Sea Islands, is also distinct.

[67] Günther, Journ. Mus. Godef. i, 2, 1873, p. 101. Bowen, Queensland.
[68] Palacky, Australien, 1861, p. 69.
[69] Cuvier and Valenciennes, Hist. Nat. Poiss. xii, March, 1837, p. 59. Carteret Harbour, New Ireland. *Id.* Fowler, Mem. Bish Mus. x, 1928, p. 405.
[70] Macleay, Proc. Linn. Soc. N.S. Wales ii, June, 1878, p. 357, pl. ix, fig. 6. Port Darwin.
[71] Otto, Conspect. anim. i, 1821, p. 7.
[72] McCulloch, Austr. Mus. Mem. v, 1929, p. 381.
[73] Waite, Rec. Austr. Mus. iv, 1902, p. 194.
[74] De Vis, Proc. Linn. Soc. N.S. Wales ix, Nov. 29, 1884, p. 686. Moreton Bay, Queensland.
[75] Smitt, Ofv. Akad. Forh. lvi, 1899, p. 552.
[76] Jordan and Snyder, Proc. U.S. Nat. Mus. xxiv, 1901, p. 55, fig. 5. Japan.
[77] Jordan and Seale, Bull. Bur. Fish. Wash. xxv, 1906, p. 395, Orthotype, *V. fontinalis*, J. and S. from Samoa.

Whether *Gobius stigmaticus* De Vis, which has been figured as *Mugilogobius devisi* by McCulloch and Ogilby,[78] is strictly congeneric with the second Australian species, *Mugilogobius galwayi* McCulloch and Waite[79] is also open to question, the disparity in squamation, size of eye, and other details leading me to consider them as distinct subgenera. For the latter species I therefore propose the new subgeneric name *Lizagobius,* so that our species may now be known as *Ellogobius* (*Ellogobius*) *stigmaticus* (De Vis) from Queensland and New South Wales and *Ellogobius* (*Lizagobius*) *galwayi* (McCulloch and Waite) from South Australia.

Family **BLENNIIDAE.**

Atrosalarias gen. nov.

Orthotype, *Salarias phaiosoma* Bleeker.

Allied to *Salarias,* but with deep, short body and the posterior rays of dorsal, anal, and caudal fins very long. Upper lip crenulated, canines vestigial, reduced to a small internal tooth on each side of the mandible. A small tentacle over each eye; no other tentacles or cirrhi. Dorsal fin not notched, its rays increasing in height backwards. Twenty or more dorsal and anal rays. Anterior anal rays produced beyond the fin-membranes.

Colouration largely uniform dark brown, though pectorals and caudal may be yellowish.

Atrosalarias phaiosoma (Bleeker).

Salarias phaiosoma Bleeker, Nat. Tijdschr. Ned Ind., viii, 1855, p. 317. Batu Archipelago.

The Australian species hitherto known as *Salarias fuscus* Rüppell[80] should now be called *Atrosalarias phaiosoma.* Rüppell describes and figures his species as having D. 30; A. 20; P. 16; V. 2; C. 12, short and rounded. Posterior dorsal and anal rays not much longer than others; three anterior anal rays produced beyond membrane. Minute tentacles over eye only. Depth 3 in s.l.; head 4. Colour brown except pectorals, caudal peduncle and fin.

The Australian and Pacific form has been figured as *Salarias fuscus* by Günther[81] with D. 30; A. 21; P. 11; V. 2; C. 11, long and pointed. Posterior dorsal and anal rays very long; about seven anal rays produced beyond membrane. Ocular tentacle larger. Tail dark. Depth more than 3 in s.l.; head nearly 4½.

The Australian Museum has specimens of the *phaiosoma* form from Sind and the New Hebrides, and from Queensland, including McCulloch and McNeill's specimens.

Blennius (Queriblennius) gaudichaudi subg. et sp. nov.

Blennius punctatus Quoy and Gaimard. Voy. Uran. Physic. (1824), p. 250. Baie des Chiens-Marins = Shark Bay, W. Australia. Preoccupied by *B. punctatus* Fabricius, F. Groen (1780), p. 153, *fide* Sherborn.

Under the preoccupied name *Blennius punctatus,* Quoy and Gaimard described a Blenny from Western Australia which has not since been recognised and was somehow omitted from the Australian Check-List.

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[78] McCulloch and Ogilby, Rec. Austr. Mus. xii, 1919, p. 223, pl. xxxvi, fig. 2. Moreton Bay, Queensland.
[79] McCulloch and Waite, Rec. S. Austr. Mus. i, May 24, 1918, p. 50, pl. iii, fig. 1. South Australia.
[80] Rüppell, Neue Wirbelth. Abyssin. Fische, 1838, p. 135, pl. xxxii, fig. 2. Massowah, Red Sea.
[81] Günther, Journ. Mus. Godef. xiii (Fische Südsee vii), 1877, p. 202, pl. cxvi, fig. c. Vavau.

Günther[82] doubtfully associated the species with the Atlantic *B. fucorum*, but I have no record of the species in more recent literature. As Quoy and Gaimard's description does not apply to any Blenny known to me, it is necessary to propose a new name for their species and add it to the Australian list. I therefore call it *gaudichaudi* after the energetic collector who worked with Quoy and Gaimard and made beautiful paintings of, amongst other animals, the species of Salpa from the waters around Sydney.

Family SCORPAENIDAE.

Vadesuma gen. nov

Orthotype, *Paracentropogon scorpio* Ogilby[83] = *Vadesuma scorpio.*

The type-species has been associated with *Liocranium* Ogilby = *Abcichthys* Whitley[84] by authors, but differs in being much more elongate and having the diameter of the eye much less than width of interorbital space and gillrakers of first branchial arch long, slender and flattened. McCulloch[85] has described and figured it as *Liocranium scorpio* from Ogilby's holotype.

The true *Abcichthys* is allied to *Synderina* Jordan and Starks,[86] but, like this new genus, differs from it in having the lower pectoral rays simple and only four ventral rays.

Genus **Paracentropogon** Bleeker, 1876.

Paracentropogon vespa livingstonei subsp. nov

(Plate xiii, fig. 1.)

D. xiv/8; A. iii/5. P. 10. V. i/4; C. 9. L. lat. 20.

Head (24 mm.) 2.5, depth (21) nearly 3 in standard length (60).

Eye (6) 4, interorbital (4.5) 5.3, snout (7.5) 3.2 in head.

General colour brownish, marbled with darker tones. A prominent silvery blotch on body over lateral line and a dusky mark between fifth and eighth dorsal spines. Most of anterior and posterior portions of ventrals light yellow.

Described from the holotype of the subspecies, 60 mm. in standard length or 3 inches in total length. Austr. Mus. regd. no. IA. 4236.

Loc.—North-western Australia; dredged, between Broome and Cape Bossutt, by Mr. A. A. Livingstone, after whom I have pleasure in naming the subspecies.

Closely allied to the eastern *Paracentopogon vespa* Ogilby,[87] which has been described and figured by McCulloch,[88] but differing in the intensity and disposition of its colour markings.

[82] Günther, Cat. Fish. Brit. Mus. iii, 1861, p. 217.

[83] Ogilby, New Fish. Queensland Coast, December 20, 1910, p. 115, off Cape Capricorn, etc. Queensland.

[84] Whitley, Rec. Austr. Mus. xv, April 6, 1927, p. 304, Orthotype, *Liocranium praepositum* Ogilby.

[85] McCulloch, Mem. Queensland Mus. vii, 1921, p. 175, pl. xi, fig. 1.

[86] Jordan and Starks, Proc. Cal. Acad. Sci. 1901, p. 381, and Proc. U.S. Nat. Mus. xxvii, 1904, p. 164. Orthotype, *S. yamanokami* J. and S.

[87] Ogilby, New Fish. Queensland Coast, December 20, 1910, p. 116. Platypus Bay, Queensland.

[88] McCulloch, Mem. Queensland Mus. vii, 1921, p. 173, pl. x, fig. 2.

Subfamily **Pteroinae.**

Genus **Pterois** Schinz, 1822

Pterois antennata (Bloch).

Scorpaena antennata Bloch, Nat. ausl. Fische, iii, 1787, p. 21, pl. clxxxv, Amboina.

Pterois antennata Schinz, Thierreich (Cuvier), ii, 1822, p. 464.

Pseudomonopterus (*Pterois*) *antennatus* Bleeker, Atlas Ichth., ix, 1877, pl. ccccxiii, fig. 5.

One specimen (No. IA. 4126), collected by Mr. A. A. Livingstone, and three (IA. 5559-5561), presented by Mr. R. Bourne, are in the Australian Museum from Broome, Western Australia. They agree better with Bleeker's figure than with Bloch's, but cannot be specifically separated from either. The genotype of *Pterois* was designated *Scorpaena volitans* auct. by Guichenot,[89] and the present species is apparently congeneric. Fowler[90] gives an extended description and references to literature of *Pterois antennata* and Günther[91] regards *P. russelii* Bennett, 1831, from Sumatra and *P. geniserra* Cuv. and Val., 1829, from Ava [Burma] as synonyms of this species.

New record for Australia.

Family **PLATYCEPHALIDAE.**

Levanaora gen. nov.

Orthotype, *Platycephalus isacanthus* Cuvier and Valenciennes.[92]

Head-ridges not denticulated, except on posterior border of orbit. No tentacle over the eye, which is much shorter than snout.

Cranium with but a few, not numerous, irradiations. Two subequal preopercular spines. No antrorse spine.

Lateral line without prominent spines.

Anterior spine of dorsal fin long and slender. No dark blotch on first dorsal, which is brown-spotted like the second. Caudal truncate.

The type-species, *Levanaora isacanthus*, has been recorded from North Australia, New Guinea, and the East Indies.

I take this opportunity of recording *Platycephalus coronarius* Palacky[93] as a synonym of *Thysanophrys cirronasus* (Richardson).

Genus **Suggrundus** Whitley, 1930.

Suggrundus Whitley, Mem. Qld. Mus., x, 1930, p. 26, Orthotype, *Platycephalus rudis* Günther.

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[89] Guichenot, Dict. pittor. Hist. Nat. viii, 1839, p. 390.
[90] Fowler, Mem. Bishop Mus. x, 1928, p. 292.
[91] Günther, Cat. Fish. Brit. Mus. ii, 1860, p. 124.
[92] Cuvier and Valenciennes, Hist. Nat. Poiss. iv, Nov., 1829, p. 246. Waigiou and Buru, East Indies (Lesson and Garnot). Types in Paris Museum. *Id.* Cuvier, Règne Anim. (disciples' ed.). 1836, pl. xxii, fig. 3. *Id.* Sauvage, Bull. Nouv. Arch. Mus. Paris ix, 1873, p. 55, pl. vii, figs. 1-1a.
[93] Palacky, Austr. 1861, p. 156. Australia.

Suggrundus tuberculatus suggrundus subsp. nov.

Insidiator tuberculatus McCulloch, Biol. Res. Endeav., ii, 1914, pp. 138 and 142, pl. xxix and text-fig. 10, Platypus Bay, Queensland.

McCulloch's specimens are labelled *suggrundus* in the "Endeavour" collection. This manuscript name is available for the Queensland form which has much larger eyes and shorter first dorsal spine than the typical Indian *Platycephalus tuberculatus* Cuv. and Val., 1829. Holotype No. E. 2888 on deposit in Australian Museum. Lateral line smooth posteriorly.

Family **PERISTEDIONTIDAE.**

Genus **Peristedion** Lacépède, 1802.

Peristedion Lacépède Hist. Nat. Poiss, iii, 1802, p. 368. Logotype, *P. malarmat* Lacépède = *Trigla cataphracta* Linné, 1758, selected by Jordan and Gilbert, Bull. U.S. Nat. Mus., iii, 16, 1882, p. 732.

Octonus Rafinesque, Ind. Ittiol. Sicil., May, 1810, pp. 29 and 54, Haplotype, *Octonus olosteon* Raf. = *Trigla cataphracta* Linné.

Peristethion Oken, Lehrb. Naturg., iii, 2, 1816, p. 113 (*fide* Sherborn). Also spelt *Peristhedion* Oken, Allgem. Naturg., x, 6, 1836, p. 180. Errore pro *Peristedion* Lac.

Peristethium Minding, Lehrb. Naturg. Fische, 1832, p. 104 (*fide* Sherborn).

Peristethidium Agassiz, Nomencl. Zool., 1846, Index Univ., p. 280. Emend. pro *Peristedion* Lac. Type *P. malarmat* Lac. = *Trigla cataphracta* Linné.

Peristethus Kaup, Arch. Naturg. (Wiegmann), xxiv, 1, 1858, pp. 332 and 336; Proc. Zool. Soc. Lond., 1859 (Jan.-May, 1859), p. 103. Emend pro *Peristedion* Lac. and *Peristethidium* Agassiz. Type *P. malarmat* Lacépède = *Trigla cataphracta* Linné.

Polycantichthys Kaup, Arch. Naturg. (Wiegmann), xxxix, 1, 1873, p. 82. Haplotype [*Peristethus*] *orientalis* = *Peristedion orientale,* Temminck and Schlegel, Fauna Japon. Pisc. 1843, p. 37, pl. xiv, (a), figs. 1-2, from Japan.

Satyrichthys Kaup, Arch. Naturg. (Wiegmann), xxxix. 1, 1873, p. 82. Haplotype, *Peristethus rieffeli* Kaup, Proc. Zool. Soc. Lond., 1859, p. 106, pl. viii, fig. 3, from China.

Peristedium Jordan and Gilbert, Bull. U.S. Nat. Mus., iii, 16, 1882, p. 732. Emend pro *Peristedion* Lac. Orthotype *Trigla cataphracta* Gmelin [= Linné].

In his paper "Ueber die Familie Triglidae nebst einigen Worten über die Classification," J. J. Kaup (*loc. cit.,* 1873, pp. 71-94) proposed a number of new generic names, some of which have been unaccountably ignored. Apart from *Ablabys* (p. 80), a new genus of Apistinae, the novelties are Trigloid fishes.

Mastigophorus is introduced (p. 82) for [*Dactylopterus*] *orientalis, macracanthus,* and *chirophthalmus.*

I select *D. orientalis* Cuv. and Val. as genotype, but *Mastigophorus* will not replace *Dactyloptena* Jordan and Richardson, 1908, as the name is preoccupied by *Mastigophorus* Poey 1832, a genus of *Lepidoptera.*

Polycantichthys and *Satyrichthys* (*vide supra*) are further separations from *Peristedion* and deserve generic rank; they have been quite overlooked by ichthyologists.

Kaup also proposed *Sagenocephalus* (p. 83) for *Prionotus carolinus* and *japonicus* Bleeker. I select the latter species as genotype, as *Trigla carolina* Linné is the type of *Merulinus* Jordan and Evermann = *Triscurrichthys* Whitley, 1931.

On p. 83 also, *Dinichythys* is proposed by Kaup for the species with short pectoral fins, *horrens* and *binotatus*; *Prionotus horrens* Richardson may be designated genotype. Newberry's famous fossil genus *Dinichthys* of the same year may preoccupy Kaup's name.

Panichthys subg. nov.

Orthotype, *Peristedion picturatum* McCulloch.

Australian representatives of the genus *Peristedion, sensu lato,* differ from the genotype, *Trigla cataphracta* Linné, in lacking the spiny ridge over the eyes and the longitudinal bony ridge between the eyes and the trenchant preopercular keel. The more anterior of the two pairs of abdominal scutes are comparatively slenderer and longer in typical *Peristedion* than in Australian examples.

Peristedion (Panichthys) picturatum McCulloch.

Peristedion picturatum McCulloch, Biol. Res. Endeavour v, June 8, 1926, p. 212, pl. lvi, east of Flinders Island, Bass Strait; 70-100 fathoms.

The unique holotype of this species, a specimen 159 mm. long, is on deposit in the Australian Museum. Mr. G. W. Ling, of Sydney, recently presented what I thought was a second specimen of this species from New South Wales, but comparison with the type showed remarkable differences which entitle the northern specimen to subspecific separation, thus—

Peristedion (Panichthys) picturatum lingi subsp. nov.

The New South Wales specimen differs from McCulloch's holotype in being more than twice as large and in having the anterior cornua converging towards one another, barbels less finely cirrhate, and in lacking the very striking black markings on the fins. Further, the New South Wales specimen possesses prominent preopercular spines, as long as the eye; these spines are lacking in McCulloch's holotype but may have been broken off when it was caught. There are two pairs of preocular spines, one near each nostril, and one median spine on the forehead in the larger specimen which are not developed in the holotype. Total length 13 inches.

General colour, when fresh, pink, with olive edges to scutes and some greenish-brown spots on anterior dorsal fin. The pectorals are pink with dense greyish reticulations. Pupil of eye, dark blue; iris with smoky, greyish and pearly tints.

Named in honour of Mr. George William Ling, who secured the specimen when on the trawler "Durraween."

Loc.—S.E. by E. from South Head of Sydney Harbour; 85-90 fathoms, 5 April, 1933. Holotype of subspecies, Aust. Mus. regd. No. IA. 5690. A novel addition to the fish-fauna of New South Wales. A second specimen from the same locality has dark margins to dorsal fins and brown reticulations over the head. Paratype, IA. 5810; pres. A. Ward.

The recent extension of trawling operations into depths of 110 fathoms in waters east of Sydney has brought to light several specimens of hitherto almost unique fishes. Captain K. Moller recently secured *Lepidopus lex, Chaunax endeavouri,* and *Quinquarius hendecacanthus* there, the last-named constituting a new record for New South Wales (Austr. Mus. regd. Nos. IA. 5807-8), and Mr. Alec. Ward has brought to light a spiny dogfish, *Oxynotus bruniensis,* another addition to the New South Wales list; Austr. Mus. regd. No. IA. 5811. In a depth of 130 fathoms, about 30 miles east of Sydney, Captain Moller obtained a specimen of *Centriscops obliquus* Waite (No. IA. 5814), new to the State, and some novelties which it is hoped will be described in detail later.

Family **APLOACTIDAE.**

Scorpaenoid fishes with the dorsal fin originating above or slightly before the eye. Bones of the head with knob-like prominences. Scales absent, the skin being covered with velvety villi. No palatine teeth. Vomer toothed. Gill membranes free (except in *Bathyaploactis* gen. nov.). No slit behind last gill. No free pectoral rays. Less than four ventral rays, the innermost not adnate. Anal spines absent, or indistinct. Caudal rounded.

As the family contains but a few genera, a brief revision of them is here offered. These are evidently derived from a Scorpaenoid stock and genera such as *Erisphex* and *Cocotropus* are intermediate. The Synancejidae are not very distantly related.

Genus **Aploactis** Temminck and Schlegel, 1843.

Aploactis Temminck and Schlegel, Fauna Japon, Poiss. 1843, p. 51, pl. xxii, figs. 3-4. *Genus caelebs.* Logotype. *Synanceia* (*Aploactis*) *aspera* Richardson, 1845, based on *A.*sp. T. & Schl. *Id.* Richardson Rept. 15th meet. Brit. Assn. Adv. Sci., 1845 (late 1846), p. 212. *Id.* Gunther, Cat. Fish. Brit. Mus., ii, 1860, p. 142. *Id.* Bleeker, Versl. Aka. Amsterdam (2), ix, 1876, p. 300 (*fide* Weber and Beaufort, 1911). *Id.* Jordan and Starks, Proc. U.S. Nat. Mus., xxvii, Jan. 22, 1904, p. 171. *Id.* McCulloch, Proc. Linn. Soc. N.S. Wales, xl, 2, 1915, p. 272.

Haploactis Agassiz, Nomencl. Zool. 1846, Index Univ., p. 172. Emendation for *Aploactis* Temminck and Schlegel. Logotype, *Synanceia* (*Aploactis*) *aspera* Rich. by present designation. *Id.* Van der Hoeven, Handb. Zool. (ed. Clark). ii, 1858, p. 184. Haplotype *H. cottoides* v. d. Hoeven = *Aploactis aspera* (Richardson).

Aploactus Kaup, Archiv. Nat. (Wiegmann), xxiv, 1, 1858, p. 331.

A continuous bony ridge across the cheek. Mouth large, oblique. Snout short. No palatine teeth. Body very elongated. Dorsal fin originating over posterior half of eye, deeply notched, the anterior three spines separate. No anal spines. V.i, 2.

Aploactis aspera (Richardson).

Aploactis Temminck and Schlegel, Fauna Japon. Poiss, 1843, p. 51, xxii, figs. 3-4, no specific name. Japan.

Synanceia (*Aploactis*) *aspera* Richardson, Zool. Voy. Sulphur i, Fishes, 1845, p. 72. Based on Temminck and Schlegel. Seas of Japan.

Aploactis aspera Richardson Rept. 15th meet Brit. Assn. Adv. Sci., 1845 (1846), p. 212 (gives refs. to Tilesius and Pallas, etc.). *Id.* Bleeker, Verh. Bat. Gen. xxv, 1853, Japan, p. 29 and Act. Soc. Reg. Sci. Ind. Ned. vi, 1859, p. 246. *Id.* Gunther, Cat. Fish. Brit. Mus. ii, 1860, p. 142. *Id.* Bleeker, Ned. Tijdschr. Dierk. iv, 1873, p. 141 (China), and Versl. Akad. Amsterd. (2) ix, 1876, p. 300 *et ibid.* xviii, 1879, p. 12 (*fide* Weber and Beaufort, 1911). *Id.* Steindachner and Döderlein, Fische Japans iv, 1884, p. 197 (Kagoshima, Japan). *Id.* Jordan and Starks, Proc. U.S. Nat. Mus xxvii, Jan. 22, 1904, p. 171, fig. 20 (Nagasaki, Japan). *Id.* Jordan, Tanaka, and Snyder, Journ. Coll. Sci. Imp. Univ. Tokyo, xxxiii, 1913, p. 252, fig. 187. *Id.* Jordan and Thompson, Mem. Carneg. Mus., vi, 4, Sept., 1914, p. 276, fig. 45 (Misaki). *Id.* Chu, Biol. Bull. St. John's Univ., i, Jan., 1931, p. 146, No. 1201.

Haploactis cottoides Van der Hoeven, Handb. Zool. (ed. Clark), ii, 1858, p. 184, based on *Aploactis* sp. Temminck and Schlegel. *Id.* Weber and Beaufort, Fish Indo-Austr. Arch, i, 1911, p. 203.

A small Japanese specimen (A. 8391) in Austr. Mus.. Jordan and Starks give the length as up to 95 mm. Range, China and Japan.

Genus **Aploactisoma** Castlenau, 1872.

Aploactisoma Castelnau, Proc. Zool. Acclim. Soc. Vict. i, July 15, 1872, p. 244, *et ibid.* ii, 1873, p. 63 Haplotype, *A. schomburgki* Castelnau. *Id.* Bleeker, Vers. Akad. Amsterdam (2) ix, 1876, p. 300 (*fide* Weber and Beaufort).

Haploactisoma O'Shaugnessy, Zool. Rec. 1873 (1875), p. 110. Emendation.

Haplotype A. *schomburgki* Castelnau.

Distinguished from *Aploactis* by its cephalic architecture, cheek crossed by a series of knobs, longer snout and small mouth. First five dorsal spines with broad membranes forming a differentiated but not separate fin anteriorly, originating over anterior half of eye. Body elongate.

Aploactisoma milesii (Richardson).

Aploactis milesii Richardson, Proc. Zool. Soc. Lond. Nov. 12, 1850, p. 60, Pisces, pl. i, figs. 1-2. King George's Sound, Western Australia *Id.* Bleeker, Verh. Akad. Amsterd. ii, 1855, p. 8. *Id.* Günther, Cat. Fish. Brit. Mus. ii, 1860, p. 142. *Id.* Woodward, W. Austr. Year Book 1900-1 (1902), p. 271. *Id.* Regan, Ann. Mag. Nat. Hist. (8) xi, Feb. 1, 1913, p. 175. (Skull more depressed than in Scorpaenidae and ribs absent. Vertebrae 13 + 18 = 31.) *Id.* McCulloch, Proc. Linn. Soc. N.S. Wales xl, 2, 1915, p. 272. *Id.* Waite, Rec. S. Austr. Mus. ii, 1, 1921, p. 168, fig. 274; Fishes S. Austr. 1923, p. 193 and fig. *Id.* McCulloch, Austr. Mus. Mem. v, 1929, p. 397.

Aploactisoma schomburgki Castelnau, Proc. Zool. Acclim. Soc. Vict. i, 1872, p. 244, *et ibid.* ii, 1873, p. 64. St. Vincent's Gulf, South Australia. Type (?) in Australian Museum (see McCulloch *loc. cit.* 1915).

Aploactis schomburghii Macleay, Proc. Linn. Soc. N.S. Wales v, 3, Feb., 1881, p. 441, South Australia (Castelnau).

This Western and South Australian species grows to five inches in length. The prevailing tone of spirit specimens is brown, with indistinct darker spots and marblings of purple and whitish, with the anterior dorsal fin dusky. The villi are fine and pointed, and the form is more elongate than that of the eastern form. Type (?) of *A. schomburgki* and Western Australian specimens in Australian Museum examined.

Aploactisoma milesii horrenda subsp. nov.

(Plate xiii, fig. 3.)

Aploactis milesii Macleay, Proc. Linn. Soc. N.S. Wales v, 3 Feb., 1881, p. 440 (Port Jackson). *Id.* Waite, Mem. Nat. Club N.S. Wales, 1904, p. 48. *Id.* McCulloch, Proc. Linn. Soc. N.S. Wales xl, 2, 1915, p. 272 (Port Jackson specimen). *Id* McCulloch, Austr. Zool. ii, 3, 1922, p. 118 (not figure). *Id.* Whitley, Rec. Austr. Mus. xviii, 1931, p. 119. Not *Aploactis milesii* Richardson.

Haploactis milesii Ogilby Cat. Fish N.S. Wales, 1886, p. 22. Emendation.

Body deeper than in true *A. milesii,* and covered with blunt papillose villi, Size larger, up to nearly 7 inches. Anterior dorsal spines much elevated. Colour more uniform and darker brownish than in *milesii.*

New South Wales: Holotype (No. IA. 4723) and several paratypes from Port Jackson in the Australian Museum. Mr. M. Ward collected one in Port Franklin, Victoria (No. IA. 5832), a new record for that State.

Genus **Paraploactis** Bleeker, 1864.

Paraploactis Bleeker, Nederl. Tijdschr. Dierk ii, 1864, p. 168. Haplotype *P. trachyderma* Bleeker.

Snout and face longer than in *Aploactisoma* and more deeply and elaborately sculptured; interorbital sunken to form a roughly triangular area, the base of the triangle being towards the dorsal fin, not away from it as in *Aploactisoma.*

No teeth on vomer or palatines. Dorsal originating over middle or posterior half of eye, twice notched. Profile of head steep. Eye small. Body deep anteriorly.

Bleeker remarks that this genus "se distingue . . . par l'absence de dents vomeriennes ou palatines et par l'armature de son sousorbitaire antérieur mobile à la façon des Apistus . . . par ces cinq rayons des branchies, par les protrubérances obtuses du préopercule, par une forme très-différente de la partie antérieure de la dorsale épineuse et par les deux rayons mous de la ventrale. . . ."

Paraploactis trachyderma Bleeker.

(Plate xii, fig. 5.)

Paraploactis trachyderma Bleeker, Nederl. Tijdschr. Dierk., ii, 1864, p. 169. Australia. *Id.* Bleeker, Versl. Akad. Amsterdam (2), ix, 1876, p. 300 (*fide* Weber and Beaufort, 1911). *Id.* McCulloch, Proc. Linn. Soc. N.S. Wales, xl, 2, 1915, p. 272 (Moreton Bay, Queensland). *Id.* McCulloch, Austr. Mus. Mem. v, 1929, p. 397.

Aploactis lichen De Vis, Proc. Linn. Soc. N.S.W., ix, 3, Nov. 29, 1884, p. 461, Dunwich, Moreton Bay, Queensland. Holotype, No. I. 11/75 in Queensland Museum.

As this distinctive species has not hitherto been figured, I reproduce here a sketch of De Vis' type made by McCulloch. Two specimens in Australian Museum from Moreton Bay, Queensland (No. I. 12514 and I. 7738) received from the Amateur Fishermen's Association of Queensland.

Range.—Queensland. The exact locality of Bleeker's type is unknown to me.

Erosa australiensis Borodin[94] is perhaps this species, although Dr. Borodin informs me (*in lit.*) "my *Erosa australiensis* has a different fin-formula D. xv, 9, A. ii, 7, P. 15. There is difference in the depth of the body (3½ and 3) and in the size of the head (3 and 2¾)."

Genus **Sthenopus** Richardson, 1848.

Sthenopus Richardson, Zool. Voy. Samarang, i, Fish., 1848, p. 10, Haplotype, *S. mollis* Richardson from the Sea of China.

Trichopleura Kaup. Archiv. Nat. (Wiegmann), xxiv, 1, 1858, pp. 331 and 338, New name for *Sthenopus* Richardson, 1848. Haplotype, *Sthenopus mollis* Richardson. (?)Preoccupied by *Trichopleurus* Motchoulsky, Bull. Soc. Nat. Moscou, 1845, a genus of Coleoptera, *fide* Scudder, Nomencl. Zool., 1882, p. 341.

Three separate anterior dorsal spines, the first in advance of the eye. Body deep. Lateral line with prominent processes.

Günther stated that *Sthenopus* was preoccupied, but *Sthenopis* Packard, 1863, Insecta, is the only generic name I have been able to find like it. In his Index Animalium Sherborn gives 1843 as the date of publication of *Sthenopus,* but this should be 1848; Sherborn was unable to find any publication of the name *Trichopleurus* before 1850, so neither *Sthenopus* nor *Trichopleura* appear to be preoccupied as has been supposed.

Sthenopus mollis Richardson.

Sthenopus mollis Richardson, Zool. Voy. Samarang i, Fish 1848, p. 10, pl. ii, figs. 6-7. Sea of China. Holotype in British Museum. *Id.* Bleeker, Versl. Akad. Amsterdam (2) ix, 1876, p. 299 (*fide* Weber and Beaufort, 1911).

Trichopleura mollis Kaup, Arch. Naturg. (Wiegmann) xxiv, 1, 1858, p. 338. On Richardson. *Id.* Günther, Cat. Fish Brit. Mus. ii, 1860, p. 143 (type). *Id.* Bleeker, Nederl. Tijdschr. Dierk. iv, 1873, p. 141 (*fide* Weber and Beaufort, 1911). *Id.* Chu, Biol. Bull. St. John's Univ. i, Jan., 1931, p. 146, No. 1202.

Range, China.

Aniculerosa gen. nov.

Orthotype, *Aniculerosa taprobanensis* sp. nov.

First four dorsal spines short, forming a separate fin which originates over the anterior half of the eye. Body deep. Profile of head steep. Eye small. Nearest *Paraploactis* and *Sthenopus* but differing notably in the insertion and extent of the anterior dorsal fin.

Aniculerosa taprobanensis sp. nov

Aplcactis aspersa (sic) Johnstone, Rept. Pearl Oyster Fisher. Gulf Manaar (Herdman), ii, Suppl. Rept. xv, pp. 202 and 219. South of Adam's Bridge, Ceylon. Not *Synanceia (Aploactis) aspera* Richardson, 1845.

Johnstone described and figured from Ceylon a species of Aploactid fish quite unlike the typical form of Temminck and Schlegel, as it has height 3½ instead of about 5 in total length, much smaller eyes and different armature of head.

The dorsal originates over the anterior half of the eye and the first four spines form a separate fin. The ventrals appear much reduced.

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[94] Borodin. Bull. Vanderbilt Mar. Mus. i, 3, 1932, p. 90, pl. ii. Queensland.

Insopiscis gen. nov.

Orthotype, *Cocotropus altipinnis* Waite[95] = *Insopiscis altipinnis.*
D.v/viii/10; A.ii/8.

Five anterior dorsal spines long, pungent, differentiated but not separated by a notch from the others; the first originates slightly before anterior ocular margin.

Depth of body about one-third total length.

Cocotropus altipinnis Waite was described from Lord Howe Island and has been listed therefrom as a Scorpaenid fish. Its true classification, however, is apparently nearer the Aploactidae, although it retains the Scorpaenoid anal spines and it is deserving of generic separation. The genus *Cocotropus* Kaup[96] was based on *Corythobatus echinatus* Cantor[97], but comparison of Cantor's plate with Waite's shows marked differences in the armature of the head, elevation of the body and colour markings.

Coccotropus obbesi Weber[98] also appears to require a new generic name, as even the pleaders for one-letter differences in spelling can surely not justify the separation of *Cocotropus* and *Coccotropus.* I therefore propose for it the name—

Membracidichthys gen. nov.

Orthotype, *Coccotropus obbesi* Weber=*Membracidichthys obbesi.*

Three anterior dorsal spines, elevated and forming a distinct but not separated fin, originating over middle of eye. Pectorals short and rounded. Body elongate. L.lat. 11. D.3/10/11; A.8. The complex armature of the head is also distinctive and is well shown in Weber's figure.

Bathyaploactinae subfam. nov.

Differs from true Aploactidae in having the gill-slits narrowed to a small opening near the opercular tip.

Bathyaploactis gen. nov.

Orthotype, *Bathyaploactis curtisensis,* sp. nov.

Head armed with long, knob-like preorbital and preopercular spines. Interorbital sunken, the trench widest where the premaxillary processes lie. Four barbels. Gill-openings reduced to a small aperture near the opercular flap. Villiform teeth on jaws and vomer, but apparently none on palatines. Eyes large. Nostrils with flaps. Body deep, compressed, scaleless, provided with spaced villi, and weak spines along the lateral line.

Dorsal twice notched, originating over middle of eye, the anterior seven spines forming a distinct fin which is not separate from the other spines and rays. Other fins rounded and with simple rays. Ventral with three rays, the last not adnate.

[95] Waite, Rec. Austr. Mus. v, 1, April 14, 1903, p. 41, pl. v, fig. 2. Lord Howe Island. Holotype in Australian Museum.
[96] Kaup, Arch. Nat. (Wiegmann) xxiv, 1, 1858, p. 333.
[97] Cantor, Journ. Asiat. Soc. Bengal xviii, 1850, p. 1027, pl. xiii; Cat. Malay Fish, 1850, p. 45, pl. xiii, Penang.
[98] Weber, Siboga Exped. lvii, Fische, May, 1913, p. 503, fig. 104.

Bathyaploactis curtisensis sp. nov.

(Plate xiv, fig. 1.)

D. vii/vii/8. A. 11. P. 11. V. 3. C. 12, L. lat. 10. Head (15 mm.) 2.9, depth (16.5), 2.7 in standard length (44). Eye (3) slightly greater than interorbital, and 5 in head. Other characters as in generic definition and as figured. Colour, in alcohol, brownish, with darker markings, forming a complicated variegation which is most strongly marked on the fins. Some dark-brown bars with well-marked margins around the bluish eye.

Described from the holotype, 44 mm. in standard length or 2¼ inches in total length. Australian Museum regd. no. I. 10723.

Locs.—Off Gatcombe Head, Port Curtis, Qld. (Dr. R. Pulleine), Holotype, No. I. 10723. Port Curtis (M. Ward and W. Boardman). Paratype, No. IA. 4210. Bowen, Qld. (E. H. Rainford)—figured specimen, no. IA. 1307. Albany Passage, Qld. (M. Ward), Paratype, No. IA. 3741.

Bathyaploactis curtisensis ornatissimus subsp. nov.

(Plate xiii, fig. 2.)

From Western Australia comes a well-marked subspecies in which the colouration is very strongly marked and of different pattern as the accompanying figures show. This may be named *ornatissimus*, the holotype being Austr. Mus. No. IA. 4234, a specimen 54 mm. in standard length, dredged in North Western Australia by Mr. A. A. Livingstone. A smaller paratype (IA. 4235) from the same place is also preserved.

Family **ANTENNARIIDAE.**

Genus **Antennarius** Cuvier, 1816.

"Antennarius" Lacépède, Hist. Nat. Poiss., i, 1798, p. 323. *Ex* Commerson MS. Non-binomial. Opinion 24 of the Internat. Comm. Zool. Nomencl. validated this name, but this was suspended by Opinion 89.

Chironectes Rafinesque, Analyse, 1815, p. 92. *Nomen nudum* (*fide* Sherborn). Preocc. by *Chironectes* Illiger, 1811, a genus of mammals.

Antennarius Cuvier, Règne Anim., ii, "1817" = Dec., 1816, p. 310. *Ex* Commerson MS. Logotype, *Antennarius chironectes* Commerson (*i.e.*, *Lophius chironectes* Cuvier), selected by Bleeker, Atlas Ichth., v, 1865, p. 5. Variants: *Antennaria* Bory, Dict. Class. d'Hist. Nat., i, 1822, p. 411, and *Artennarius* Garthe, Zool. Tab., 1837, Knorpelfische (*fide* Sherborn).

Chironectes Cuvier, Mem. Mus. Hist. Nat. (Paris), iii, Oct., 1817, p. 418. Tautotype, *Antennarius chironectes* Commerson, non-binom. = *Lophius chironectes* Cuvier. Variants: *Chironectus* Swainson, 1839, and *Cheironectes* Lowe, 1839. Preocc. by *Chironectes* Illiger, 1811, a genus of mammals, spelt *Cheironectes* by Gray, 1827.

Batrachopus Goldfuss, Handb. Zool., ii, 1820, p. 110. Substitute for *Chironectes*, preocc. (*fide* Jordan, Gen. Fish.).

Capellaria Gistel, Nat. Thierr., 1848, p. viii. Substitute for *Chironectes* Cuvier, *et auctt.*, *non* Illiger. Type, *Lophius chironectes* Cuvier.

Batrachops Jordan, Gen. Fish., i, 1917, p. 114. *Errore pro Batrachopus* Goldfuss. Orthotype, *"Lophius commersonianus* Lacépède" (*sic*). Preoccupied by *Batrachops* Heckel, 1840, and Bibron, 1855, two other genera of Pisces.

The genotype of *Antennarius* and its synonyms is the "Lophie chironecte" of Lacépède[99]=*Lophius chironectes* Cuvier, 1816, which was first called by its proper name, *Antennarius chironectes,* by Schinz.[100] This species was originally described as being reddish with black spots and having D. 14, A. 7, P. 8, V. 5 or 6, C. 10 or 11. From Western Australia I have received a distinct Angler Fish which, now that the status of *Antennarius* has been established, is described below as a new genus and species. The generic name *Histrio* Fischer[101] obviously applies to *Lophius histrio* Linné, a very different species, although, apparently through a transposed line or some error, Fischer described the body as depressed instead of compressed.

Lophiocharon gen. nov.

Orthotype, *Lophiocharon broomensis* sp. nov.

First dorsal spine filamentous, second and third thick, very spiny, and united to one another and the soft dorsal by broad membranes. Body very deep, compressed, very spiny, without flaps or warts. Soft dorsal and anal broadly rounded, distinct from caudal. Three or four rows of slender, backwardly directed canines on jaws and palatines and pharyngeals. None on vomer. Premaxillary steeply oblique. Eye small. General colouration blackish with lichen-like markings.

There may have been an appendage to the illicium, but, if so, it has become broken off my specimen.

Lophiocharon broomensis sp. nov.

(Plate xv, fig. 1.)

D. i, i, i, 13; A. 8; P. 9; V. 5; C. 10.

Form compressed and very deep, the depth of the body (77 mm.) 1.2 in the standard length (93). Head high. Eye small (5). Preorbital overhanging premaxillary superiorly. A sunken area each side of second dorsal spine. Illicium (20 mm.) subequal to third dorsal spine but much longer than second (12). Fins broadly rounded. Head, body and fins with prominent bidentate or tridentate spines which are particularly large on the second and third dorsal spines. Gill opening subequal to eye and situated below pectoral base. Ventral fins very short and broad. Other characters as defined for the genus.

General colour dark-brown to black, relieved in places by irregular white lichen-like patches which are fairly symmetrically disposed. The largest is formed by the fusion of two white spots on either side of the first dorsal ray. The tips of the dorsal spines are white and there are flecks of the same colour on each side of their bases and on the sides of the head. A large white patch around the ends of the maxillaries and mandibles and others along the sides of the body and on the caudal fin.

Described and figured from the holotype of the species 93 mm. in standard length or nearly 5 inches overall. Austr. Mus. reg. No. IA 5562.

Loc.—Broome, Western Australia. Presented by Mr. R. Bourne, 1932.

[99] Lacépède, Hist. Nat. Poiss. i, 1798, pp. 302 and 325, pl. xiv, fig. 2. No loc. [probably Mauritius].
[100] Schinz, Das. Thierreich (Cuvier) ii, 1822, p. 501.
[101] Fischer, Zoognosia ed. 3, i, 1813, pp. 70 and 78.

This new species may be allied to *Chironectes subrotundatus* Castelnau,[102] which is described as follows:—

> Body high; upper profile circular; lower one very convex; height contained one and two-thirds in the total length without the caudal; skin covered with rough asperities; tentacle of the snout terminated by a short linear filament; the two isolated dorsal spines about equal and very thick; they are covered with asperities: all the fins are immaculate; the body is of a light yellowish grey, having a double series of ocellated rounded spots extending on each side of the body; some of the ocellated spots are also visible on the belly; an irregular whitish ring on the base of the tail; no cutaneous tentacles on the body. The specimen is only two inches long, from Port Walcott, and was sent to me by Mr. Bostock.

The coloration, subequal dorsal spines, less depth, and smaller size indicate that Castelnau's species is distinct.

Family **OSTRACIIDAE.**

Paracanthostracion gen. nov.

Orthotype, *Ostracion lindsayi* Phillipps.[103]

Anterior profile of head oblique. Diameter of eye not much shorter than snout. Interorbital markedly concave. Carapace quadrangular, with a slight dorsal ridge. A forwardly directed spine before each eye. A large median spine on the back and a large backwardly directed spine on the lateral edge to each side of the anal fin. Dorsal extremity of carapace anterior to the ventral extremity. Scutes hexagonal, very rugose towards the posterior end of the carapace and on the head. Body marked with irregular streaks and spots; cheeks with spots, tending to form short streaks.

This generic definition has been drawn up from the holotype of *Paracanthostracion lindsayi*, kindly lent to me by Mr. W. J. Phillipps. My new genus is near *Acanthostracion* Bleeker,[104] the genotype of which, *Ostracion quadricornis* Linné[105] was designated in the Atlas Ichthyologique. Willughby's figure[106] of the type of Linné's species shows a fish with the back much more elevated and without a median spine and with the upper extremity of carapace posterior to the lower. The shape of the carapace and form and disposition of the spines distinguish *Paracanthostracion* from all the other genera of boxfishes.

Paracanthostracion lindsayi levior subsp. nov.

Lord Howe Island specimens in the Australian Museum are closely comparable with Phillipps' type but have the snout more concave in profile, fewer rugosities on the scutes, ridge behind dorsal spine conspicuous and serrated and eye comparatively larger and body very slightly deeper. These may be subspecifically named, the holotype being registered No. I. 5184. *P. lindsayi* and this subspecies both differ from the congeneric *P. pentacanthus* (Bleeker) as figured in the Atlas Ichthyologique in having the scutes smooth on the back and sides of the body, eye larger and set more obliquely, and anal spines more finely tapering.

[102] Castelnau, Vict. Offic. Rec. Philad. Exhib. Dec. 1875, p. 25. Port Walcott, W. Australia.
[103] Phillipps, N. Zeal. Journ. Sci. Tech. xiii, 4, 1932, p. 233, fig. 4. Otago, New Zealand. Holotype in Dominion Museum, Wellington, examined.
[104] Bleeker, Ned. Tijdsch. Dierk. ii, 1865, p. 301 *et ibid.* iii, 1866, p. 27; Atlas Ichth. v, 1865, p. 28.
[105] Linné, Syst. Nat. ed. 10, 1758, p. 331. *Ex* Artedi gen. 56, syn. 85. India.
[106] Willughby, Hist. Pisc. 1686, append. p. 20, pl. J. 14.

Family **TETRAODONTIDAE.**

Genus **Pleuranacanthus** Bleeker, 1865.

Pleuranacanthus Bleeker, Atlas Ichth., v., 1865, p. 65, Haplotype, *P. argentatus* Bleeker, a Museum name in synonymy of *Tetraodon argenteus* Lacépède.

Eyes united to skin of head. Nostrils in the form of low perforated papillæ. Gill openings without spurs or papillæ. Body elongate, tetragonal, with spines on the belly and smaller ones on back. Lateral line system well marked. Dorsal and anal fins pointed. Caudal peduncle depressed, the caudal fin lunate. Coloration dull olivaceous above, with dark spots, and with a silvery band along the flanks.

The genera of pufferfishes have been much confused owing to the linking up of different species by apparently intermediate forms. For the present species, *sceleratus,* distinguished by the above characters, Bleeker's name may be revived.

Many authors attribute numerous generic names to Bibron, 1855, referring to a paper[107] entitled "Note sur un travail inédit de Bibron relatif aux Poissons Plectognathes Gymnodontes (Diodons et Tétrodons); par M. le docteur Aug. Duméril. . . ."

Such names, quoted *ex* Bibron MS., are all vernaculars, though latinized later by Hollard, Bleeker, and others, but most of them are preoccupied. The genera *Apsicephalus, Promecocephalus,* and *Lagocephalus* of authors are nearest *Pleuranacanthus,* but a critical comparison of their genotypes with *Tetraodon argenteus* Lacépède is desirable, as discrepancies in degrees of smoothness, details of fin-formulae, colouration, and shape are apparent from descriptions.

Pleuranacanthus sceleratus (Gmelin).

Tetrodon sceleratus Gmelin, Syst. Nat. (Linné) ed. 13, i, 1789, p. 1,444. Based on Forster, it. i. p. 403. Habitat in oceano americano et pacifico. = New Caledonia. *Id.* Forster, Descr. Anim. (ed. Lichtenstein), 1844, p. 254. Spruce-Tree Isle, New Caledonia; poisonous.

? *Tetrodon argenteus* Lacépède Ann. Mus. Hist. Nat. (Paris), iv, May, 1804, p. 211, pl. lviii, fig. 2 (Vernac. on p. 203). West Coast of New Holland. Based on a drawing by Stanislas Levilain, one of Baudin's naturalists.

Pleuranacanthus argentatus Bleeker, Atl. Ichth., v, 1865, p. 65. No. loc. Name in Paris Museum.

Tetraodon tetragonus Waite, Rec. S. Austr. Mus., ii, April 23, 1921, p. 195, fig. 325 [Errore pro *T. sceleratus* which Gmelin described as *T. tetragonus, capite maximo*].

Sphoeroides sceleratus Fowler, Mem. Bish. Mus., x, 1928, p. 467.

D.12; A.11; P.17. Head (120 mm.) 3.3, depth (65) 7.3 in length to base of caudal (405), eye (39) 3, interorbital (52) 2.3, gill opening (33) 3.6, length of pectoral (44) 2.7, depth of caudal peduncle (13) 9.2 in head.

General form elongate coffin-shaped, quadrilateral, tapering posteriorly. Upper lip the longer but covered at the sides by the lower lip. Two teeth in each jaw forming a beak. Nostrils nearer eye than end of snout; each is a sunken oval papilla with two separate pinprick-like perforations. Eye completely united to its surrounding skin. Gill opening obliquely crescentic, without spurs or papillae.

[107] Duméril, Rev. Mag. Zool. (2) vii, 1855, pp. 274-282.

Body smooth laterally and posteriorly. Throat and belly with spaced spines. Vertex and sides of head and dorsal surface of body in advance of dorsal fin with bristle-like spines. Lateral line system prominent. A line encircles each eye, curving laterally to miss each nostril, before which an oblique line converges towards its fellow over the snout. A quadrangular area is enclosed on each side of the occiput, after which the lateral line continues along the back, diverging on each side of the dorsal fin, to finish at the base of the tail just above the strong centre-lateral ridge which extends from the chin. Anus in advance of anal fin. Dorsal and anal fins opposite, pointed. The dorsal originates about half-way between the vertical of the gill-openings and the caudal root. Upper pectoral rays longest. Caudal crescentic, the upper lobe longer than the lower.

General colour in formalin, greyish above and whitish below. A broad irregular band of silver along each side well above the ventro-lateral ridge. The dorsal surface is prominently marked with spaced, round, black spots; fins yellowish, eye bluish; inside of gill-opening blackish.

Described from a specimen nearly 18½ inches in maximum length.

Loc. Lord Howe Island; R. E. Baxter, 1920. Australian Museum regd. No. I.A. 126.

New record for Lord Howe Island.

Family **DIODONTIDAE.**

Genus **Diodon** Linné, 1758.

Diodon armillatus sp. nov.

(Plate xii, fig. 1, and plate xv, figs. 2-3.)

D.15; A.13; P.22; C.8.

Form ovate, normally broader than high, the caudal peduncle compressed and tapering. Breadth of head greater than its length or height. Anterior profile gibbous over the eyes, which are prominent, and slightly excavate on the snout. Upper jaw rather pointed and overhanging the lower, which is flatter. Lips plicate. Mouth not extending to level of nostrils, which are elevated, broad, and flap-like with the summit closed over the two olfactory openings. Eyes large, without free margins, 2 in snout and 5 in head, their diameter somewhat less than length of gill opening. A prominent rounded spur before the gillflange. Head and body armed with strong, three-rooted, movable spines which are longest behind the pectorals and shortest on the posterior part of the body. They do not extend in advance of a curved line between the eyes and on a level with the nostrils, and leave the face and chin entirely bare. About 7 interocular, 3 postocular, and 17 dorsal and preanal rows of spines. No nasal spines. There are 4 spines above the caudal peduncle and one on each side of it, a pair behind the anal fin and a median one posteriorly below the caudal peduncle, which is otherwise bare behind the dorsal and anal fins.

Dorsal originating slightly in advance of anal and smaller than that fin. Pectoral broad with the uppermost rays longest and the lowermost longer than the median rays. Caudal fin longer than the others and, like the dorsal and anal, rounded.

Colour, after preservation in formalin, greyish brown above and white below, the fins and spines yellowish. Back and sides of head and body with numerous small round brown spots, largest behind the pectorals, which do not extend on to face or belly.

Fins plain except the top of the dorsal and the entire caudal which is spotted with brown. A broad brownish band extends across the chin at the base of the anterior ventral spines. It is apparently continued as a fuscous area to each gill-opening.

Described from the holotype of the species, nearly 270 mm. in standard length, from North-west Islet, Queensland; coll. G. P. Whitley, December, 1925. Austr. Mus. regd. No. IA. 2585.

A larger paratype, nearly 15 inches long, collected by A. A. Livingstone and W. Boardman from the same locality, has the face, anterior margins of fins and many of the spines spotted with brown. Regd. No. IA. 4776.

The collar-like band on the chin is a diagnostic character of this species, which also differs from its congeners in having stronger spines, not notably produced on top of head. The spots of the body are larger than those of *Diodon holacanthus* Linné, and there are no large lateral spots or blotches as in other species of the genus.

Family **RANZANIIDAE.**

Genus **Ranzania** Nardo, 1840.

Ranzania Nardo, Atti i Riun. Sci. Ital. ed. 2, 1840, p. 165. Orthotype, *R. typus* Nardo (*fide* Sherborn, Index Anim.) or Ann. Sci. Reg. Lombard Venet, v, 1839, pp. 10 and 105. Orthotype, *Tetrodon truncatus*, Retzius (*fide* Jordan, Gen. Fish., ii, 1919, p. 196).

? *Pallasia* Nardo, Ann. Sci. Lombard. Veneto, x, 1840, p. 112. Tautotype, *P. pallasi* Nardo (*fide* Jordan, Gen. Fish.). Preoccupied by *Pallasia* Robineau-Desvoidy, 1830, Diptera and *Pallasius* Leach, 1814, Crustacea.

Molacanthus Swainson, Nat. Hist. Class. Fish. Amphib. Rept., ii, July, 1839, pp. 195 and 329. Haplotype, *M. pallasii*, Swainson, based on "Pall. Spec. Zool. pl. 4."

Centaurus Kaup., Archiv. f. Naturg. (Wiegmann), xxi, 1, 1855, p. 221. Haplotype, *Ostracion boops* Richardson.

According to Jordan's Genera of Fishes (ii, 1919, p. 196), *Tympanomium* Ranzani (type, *T. planci* Ranzani) is a synonym of *Mola*, yet Jordan and Evermann included *Mola planci* Nardo in the synonymy of *Ranzania truncata*. This suggests that *Ranzania* may be a synonym of *Timpanomium* Ranzani, 1839 (spelt thus in Sherborn), but *Tympanium* (sic) Ranzani, as described by Troschel,[108] with *Mola altera* Planci = *Tympanium planci* Ranzani as type, is evidently a *Mola*. The genus *Ozodura*, which is also only known to me from Troschel's resumé, appears to differ from *Ranzania* in fin-formulae.

Ranzania laevis (Pennant).

—— [Kircher], Rer. Hist. Nat. (ed. Bonnani and Battara), 1773, app. pl. i, upper fig.

Ostracion laevis Pennant, Brit. Zool., iii, 1776, ed. 4, p. 129, pl. xix, fig. 54. Plymouth, England. Not ref. to Gronow in synonymy. For a note on this edition of Pennant, see Iredale, Proc. Malac. Soc. xv, 1922, p. 80.

[108] Troschel, Archiv. f. Naturg. (Wiegmann), vii, 2, 1841, p. 141.

? *Ostracion mola* Meuschen, Zoophyl. Gronov., 1781, Index, no. 185. Apparently a composite species. Not *Tetraodon mola* Linné, 1758.

Tetrodon truncatus Retzius, K. Vet. Ac. Nya. Handl., vi, 1785, p. 121 (*fide* Sherborn). Brazil (*fide* Jordan, Evermann, and Clark, 1930, p. 504). *Id.* Gmelin, Syst. Nat. (Linné), ed. 13, i, 3, 1789, p. 1448. Mediterranean and European Seas. *Ex* Planc. Prompt. Hamb.; Monti act. Bonon; and Brit. Zool.

Balistes truncatus Pennant, Outlines of Globe i, 1798, p. 213. Ceylon.

Orthagoriscus oblongus Bloch and Schneider, Syst. Ichth., 1801, p. 511, pl. xcvii. *Ex* Pennant, Brit. Zool.

Cephalus varius Shaw, Gen. Zool., v, 2, 1804, p. 439. Indian Seas (Commerson).

Cephalus oblongus Shaw, Gen. Zool., v, 2, 1804, p. 439, pl. 176. No loc. [Europe]. *Id.* Turton, Brit. Fauna, 1807, p. 116.

Cephalus elongatus Risso, Hist. Nat. Europe Merid., iii, 1826, p. 173. Villefranche.

? *Mola planci* Nardo, Isis, xx (6), June, 1827, p. 477; Giorn. Fisica (2) x, 1827, p. 104 (*fide* Sherborn); or Bull. Sci. Nat. (Ferussac), xiii, 1828, p. 437 (*fide* Jordan and Evermann, 1898).

Orthagoriscus truncatus Fleming, Hist. Brit. Anim., 1828, p. 175. *Ex "Tetrodon trun.* Don. Brit. Fishes," etc. English coast. *Id.* Day, Fish. Gt. Brit. Ire., ii, 1884, p. 276, pl. cxlix.

Cephalus cocherani Traill, Mem. Werner. Nat. Hist. Soc., vi, Jan., 1832, p. 381 (*fide* Sherborn).

Molacanthus pallasii Swainson, Nat. Hist. Class. Fish. Amphib. Rept., ii, July, 1839, p. 329. Based on Pallas, Spicilegia Zool., which I have not seen.

Orthragoriscus elegans and *battarae* Ranzani, N. Comm. Ac. Sci. Inst. Bonon, iii, 1839, Dispositio (*fide* Day, and Sherborn).

? *Timpanomium planci* Ranzani, N. Comm. Ac. Sci. Inst. Bonon, iii, 1839, Dispositio.

Ranzania typus Nardo, Atti i Riun. Sci. Ital., ed. 2, 1840, p. 165 (*fide* Sherborn).

Ranzania truncata Nardo, Ann. Sci. Regn. Lombard. Venet., x, 1840, p. 105 (*fide* Day), and of most authors.

? *Tympanomium planci* Ranzani, Mem. Stor. Nat., ii, 1844, Diss. Fam. Molarum, Tab. (*fide* Sherborn).

Ostracion boops Richardson, Zool. Voy. Erebus and Terror. Fish., 1845, p. 52, pl. xxx, figs. 18-21. South Atlantic; tow-netted.

Orthagoriscus planci and *oblongus* Bonaparte, Cat. met. Pesci, Eur., 1848, p. 88.

Orthragoriscus lunaris Gray, Cat. Fish. coll. Gronow Brit. Mus. 1854, p. 165. *Ex* Gronow MS. Mediterranean.

Ranzania makua Jenkins, Proc. Calif. Acad. Sci. (2) v, Oct. 31, 1895, p. 779, with coloured frontispiece, Pearl Harbour, Hawaii, and of authors. *Id.* McCulloch, Abstr. Proc. Linn. Soc. N.S. Wales, June 29, 1910, p. ii (W.A.).

Cephalus cochranei Sherborn, Index. Anim. 1801-50, January, 1925, p. 1382. Emendation for *C. cocherani* Traill, 1832.

Ranzania laevis Whitley, Vict. Nat. xlix, 1933, p. 211, figs. 6 and 7 (Victoria, Mauritius, etc.).

The oblong Sunfish has been recorded from the Mediterranean Sea, British Isles and Atlantic Ocean, Martinique, Bermudas, and Brazil. This is apparently the range of the typical form, which was called *Ostracion laevis* by Pennant

several years before Retzius' name, *Tetrodon truncatus*. Thus the form usually called *Ranzania truncata* must now be *R. laevis*. A second species, or form of *R. laevis*, from California, Hawaii, the Philippines, and Japan, has been named *Ranzania makua*. A third comes from Mauritius and the Cape Seas, whilst, in a brief note, McCulloch recorded *Ranzania makua* from West Australia in 1910. The Mauritius form was named *varius* by Shaw, but the Australian is nameless.

Whilst in Melbourne in 1928 I noticed a specimen of this sunfish on exhibition in the National Museum, Melbourne (No. 45586), labelled Portland Bay, Victoria, which I placed on record in 1933.

The oblong sunfish is evidently a pelagic fish, which is doubtless drifted over large expanses of ocean by the currents and is thus rarely encounted from continental shorelines. All sunfishes are known to undergo great changes in form with growth,[109] whilst the bright colours of the present species appear to change after death. Nevertheless, it may be possible to differentiate several species or subspecies from geographical regions, in which case the Australian form, if new, would require a new name.

Amongst the manuscripts of the late E. P. Ramsay, I find the following description of an Australian Museum specimen:—

"Dec. 17th, 1884. The Museum has just received from Mr. Robillard, of Mauritius, a small specimen of *Orthagoriscus truncatus*.

"D.19 to 20; A.19 to 20; C.19; Pect. 13. Total length of skin, 19.5 inches. Height of body between the D. and A. fins, 8 inches; ditto across the tip of the pectorals, 11.5 inches. Dorsal fin, 7 inches. Anal, 6. Caudal, 8 x 1.8. Length of pectoral, 4.8; width, 1.2. Eye opening, 1.3, its diameter in the length of the snout is 2½ times; the mouth is on a level with the snout. Radiating from the eye are three pairs of parallel narrow dark lines. On the snout a little nearer to the mouth than to the eye is another similar pair; between the pectorals and the eyes, and above the fin on the back are irregular dark markings of various shapes. The sides, belly, and the space between the pectorals and snout are silvery. Both sides are not marked alike: on one the parallel bands are curved downwards to the belly and the silvery patches behind the eye are sprinkled over with blackish oblong or round spots, or enclose irregular blotches. There are indications of curved bars on the sides of the belly to near the vent."

Amongst some fish drawings belonging to the late A. R. McCulloch, I find a rough painting of a *Ranzania*, unfortunately without data, unless the pencilled remark on the back, "Aneiteum. Tasi—the chief of the island," indicates a New Hebridean origin. The general colour is dark blue on the back, becoming lighter on the sides and belly and crossed by lighter bars with dark edges which are oblique anteriorly and vertical posteriorly and mingle with dark blue spots towards the ventral surface. Two broad transverse bars of rich brown join the dorsal and anal fins, which are blue, and the anterior portion of the tail and some spots on the hinder part of the body are light green. The eye and some of the tops of the oblique bars are red, and there is a wedge-shaped light blue area behind the head and pointing towards the back. In this painting the bars do not radiate from the eye as in Ramsay's specimen.

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[109] Schmidt, Medd. Hav. Kjob. Ser. Fisk vi, 6, 1921, pp. 1-13, pl. i and text figs., and Nature, March 17, 1921, p. 76, figs. 2-5.

Mr. L. Glauert, of the Western Australian Museum, Perth, has kindly drawn my attention to a note on *Ranzania* in the *West Australian* of 14th April, 1928, in which it is stated:

"On Tuesday last, on the Middleton Beach at Albany, large numbers of the exceedingly rare oblong sunfish were to be seen in a shoal. About fifty of the fish were lying stranded on the beach, and one of them was despatched by Mr. T. W. Knight, of Albany, to the W.A. Museum, where it was recognised as being, in technical language, *Ranzania truncata,* the third specimen of its kind ever taken in Australia. The two previous specimens also come from Albany. . . .

"Owing to the flattened condition of the body, the fish, which is 24 inches long, 11 inches high, and 4 inches in thickness, very likely, is able to swim at a very great speed."

Mr. Glauert adds: "After a cast had been prepared this specimen was passed to the Australian Museum as an exchange. It is evidently the fish which McCulloch received from Middleton Beach, Albany."

EXPLANATION OF PLATES.

PLATE XI.

Fig. 1.—*Germo germon steadi* Whitley. Holotype of subspecies, 38 inches long, from New South Wales. Austr. Mus. regd. No. IA.2457.

Fig. 2.—*Ulapiscis kennedyi* Whitley. Holotype, 265 mm. standard length, from Ellice Islands, Oceania. Austr. Mus. regd. No. IA.5534.

Fig. 3.—*Obtortiophagus koumansi* Whitley. Holotype, 50 mm. standard length, from Hayman Island, Queensland. Austr. Mus. regd. No. IA.2027.

PLATE XII.

Fig. 1.—*Diodon armillatus* Whitley. A dermal spine from the holotype, figured on plate xv.

Fig. 2.—*Galaxias dissimilis* Regan. Holotype, 75 mm. long, from (?) New South Wales, in the British Museum.

Fig. 3.—*Galaxias oconnori* Ogilby. Holotype, 77 mm. long, from Lyra, Queensland. Qld. Mus, regd. No. I.421.

Fig. 4.—*Hoplocoryphis physaliarum* Whitley. A small specimen from Long Bay, New South Wales.

Fig. 5.—*Paraploactis trachyderma* Bleeker. Holotype of *Aploactis lichen* De Vis. Queensland Mus. regd. No. I.11/75.

PLATE XIII.

Fig. 1.—*Paracentropogon vespa livingstonei* Whitley. Holotype of subspecies, 60 mm. standard length, from North-western Australia. Austr. Mus. regd. No. IA.4236.

Fig. 2.—*Bathyaploactis curtisensis ornatissimus* Whitley. Holotype of subspecies, 54 mm. standard length, from North-western Australia. Austr. Mus. regd. No. IA.4234.

Fig. 3.—*Aploactisoma milesii horrenda* Whitley. A specimen from New South Wales

PLATE XIV.

Fig. 1.—*Bathyaploactis curtisensis curtisensis* Whitley. A paratype from Bowen, Queensland. Austr. Mus. regd. No. IA.1307.

Fig. 2.—*Crinodus lophodon* (Günther). A specimen, 174 mm. standard length, from Coogee, New South Wales. Austr. Mus. regd. No. IA.726.

PLATE XV.

Fig. 1.—*Lophiocharon broomensis* Whitley. Holotype, 93 mm. standard length, from Broome, Western Australia. Austr. Mus. regd. No. IA.5562.

Fig. 2.—*Diodon armillatus* Whitley. Lateral view of the Holotype, nearly 270 mm. standard length, from North-west Islet, Queensland. Austr. Mus. regd. No. IA.2585. There is some unavoidable foreshortening of the anterior end, due to the marked convexity of the specimen.

Fig. 3.—*Diodon armillatus* Whitley. Front view of holotype, figured also on pl. xii, fig. 1, and pl. xv, fig. 2.

Sydney: Alfred James Kent, I.S.O., Government Printer—1938.

G. C. CLUTTON, photo.

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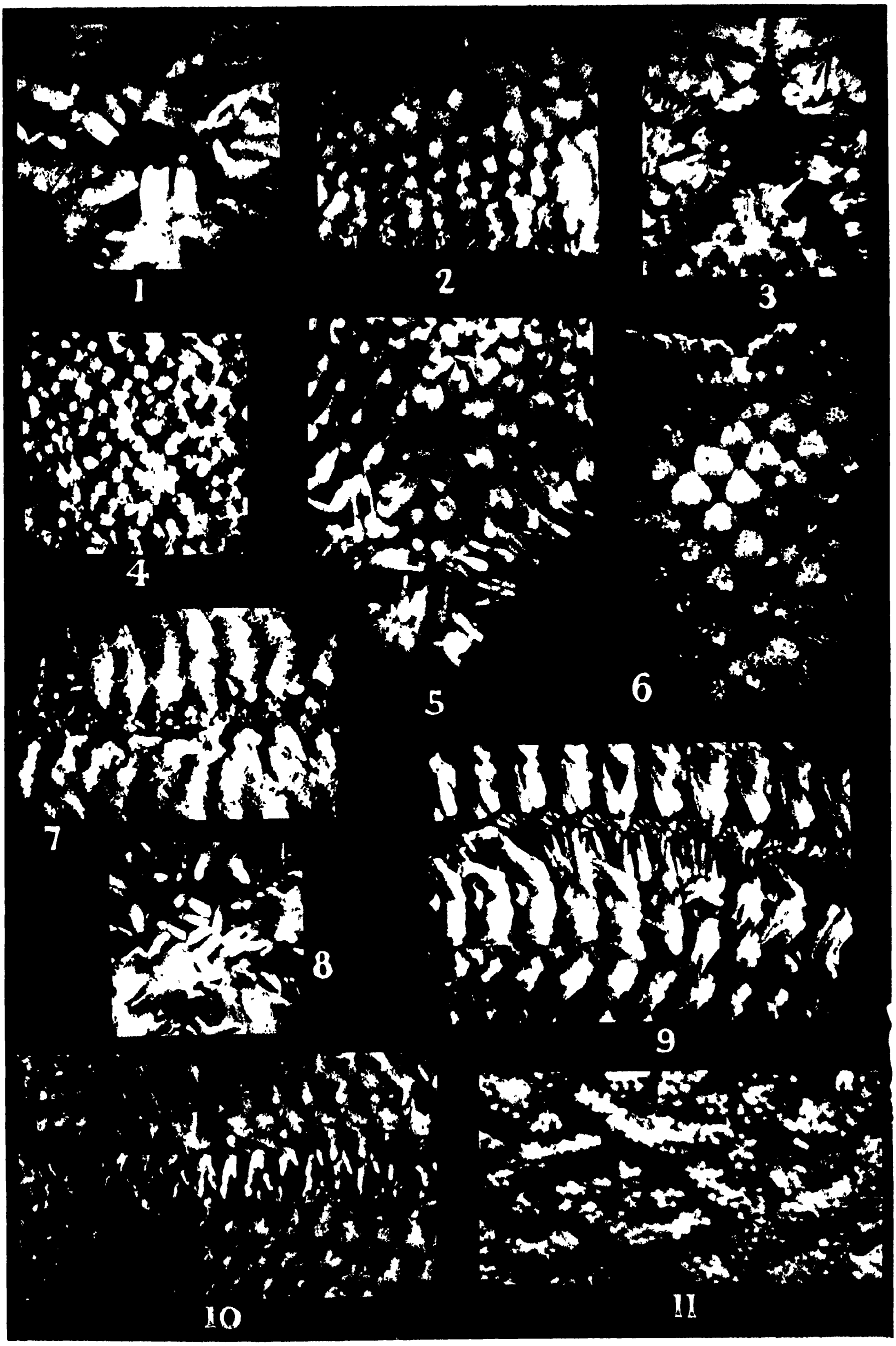

G. C. CLUTTON, photo.

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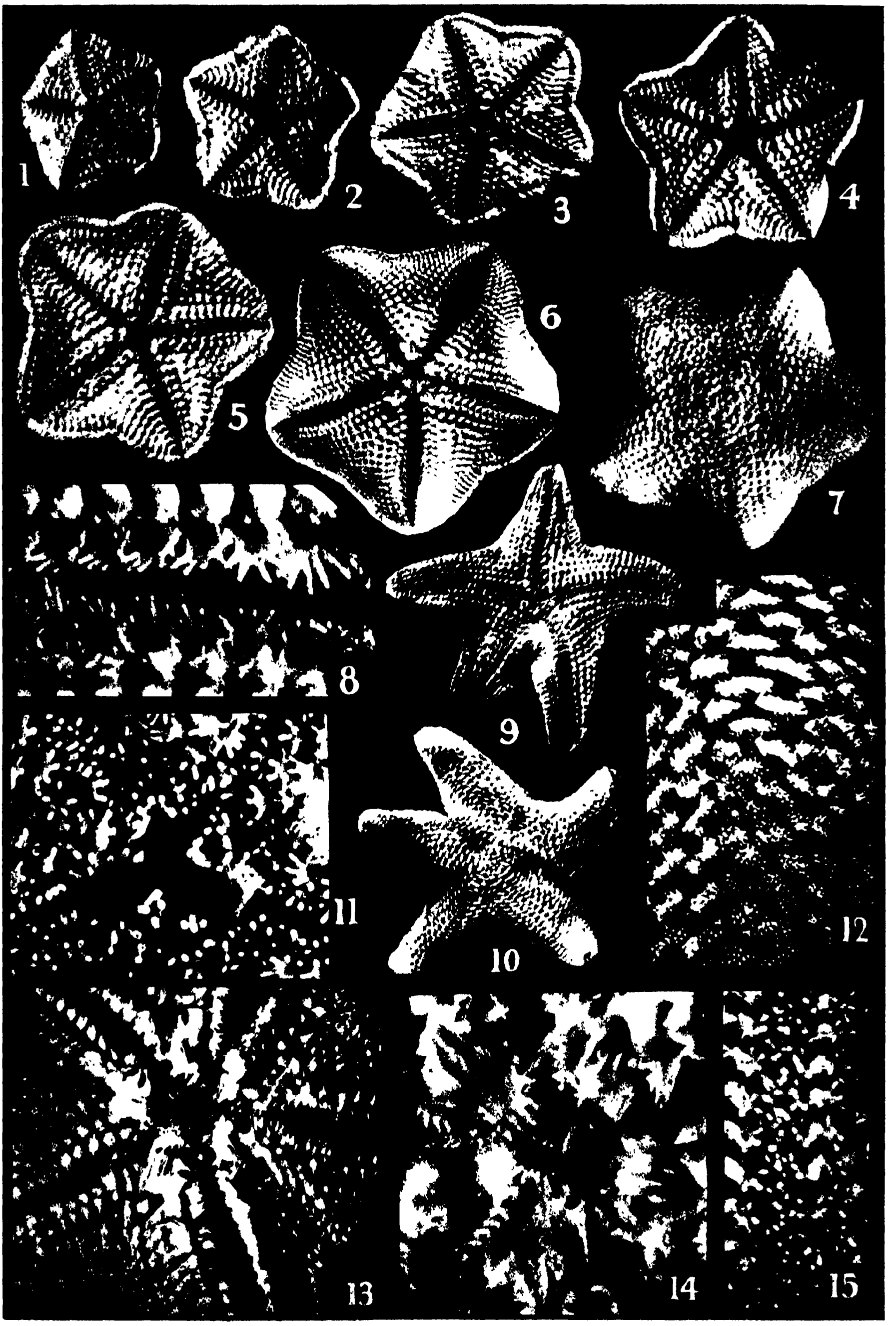
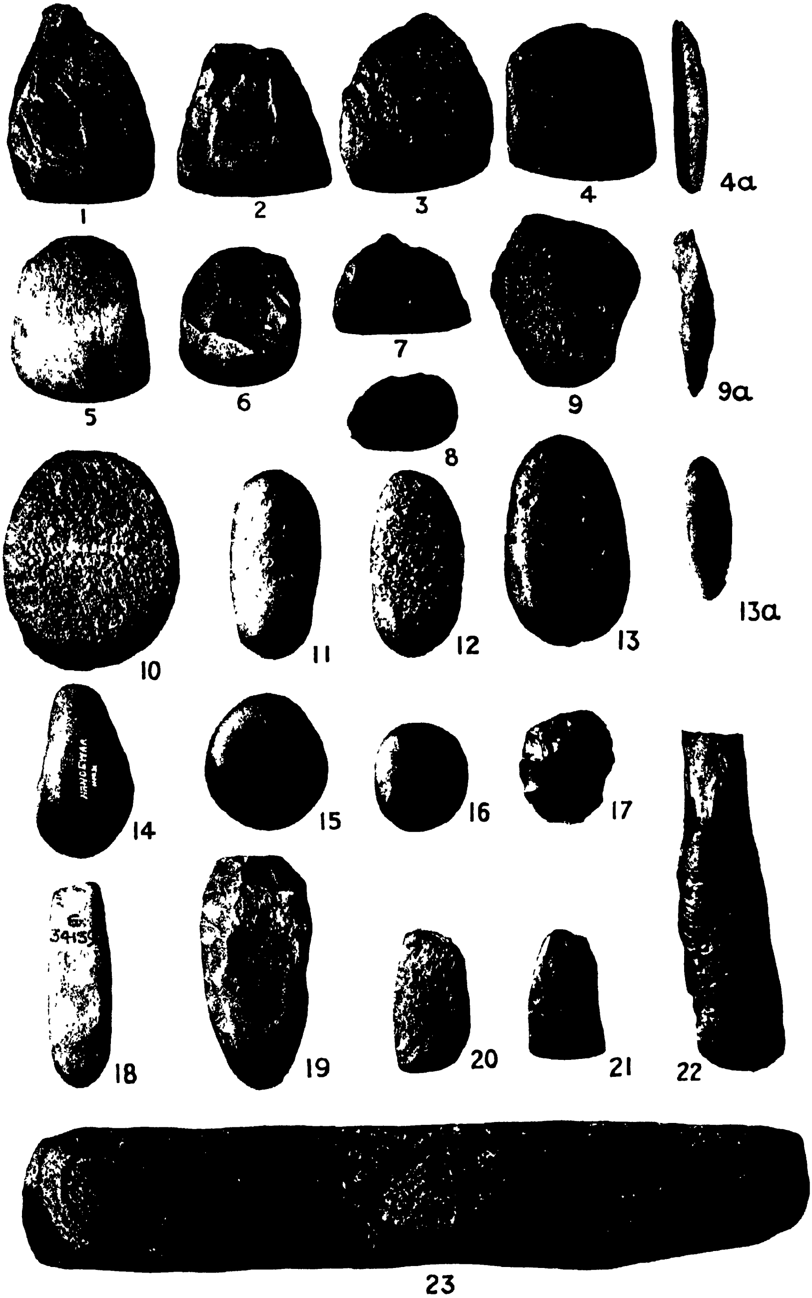
G. C. CLUTTON, photo.



G. C. CLUTTON, photo.

G. C. CLUTTON, photo.



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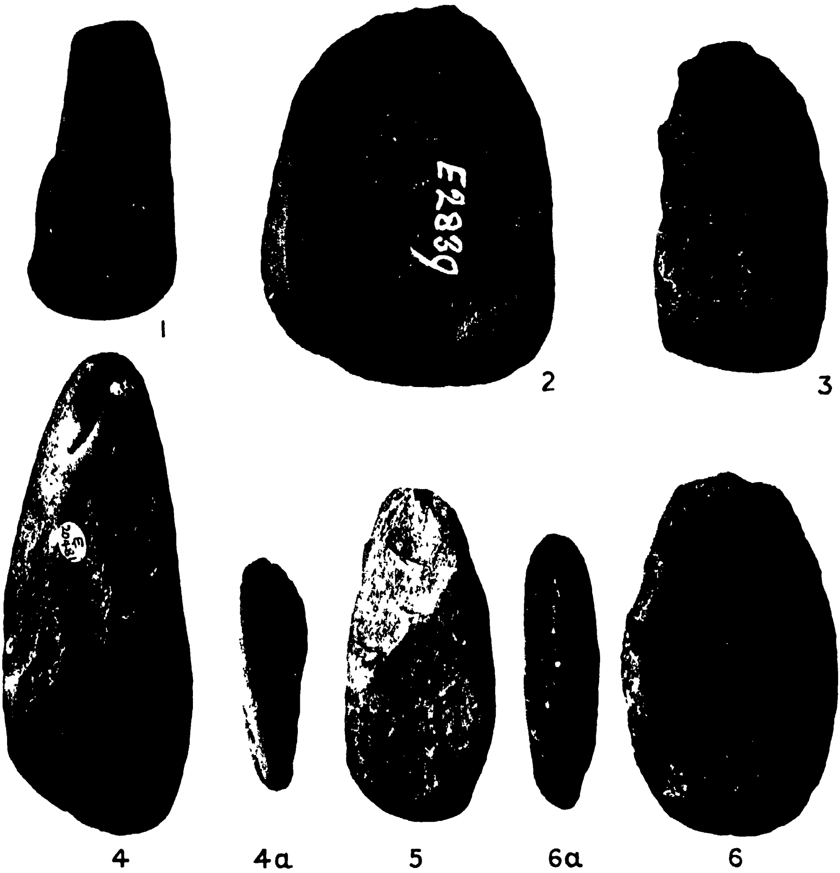

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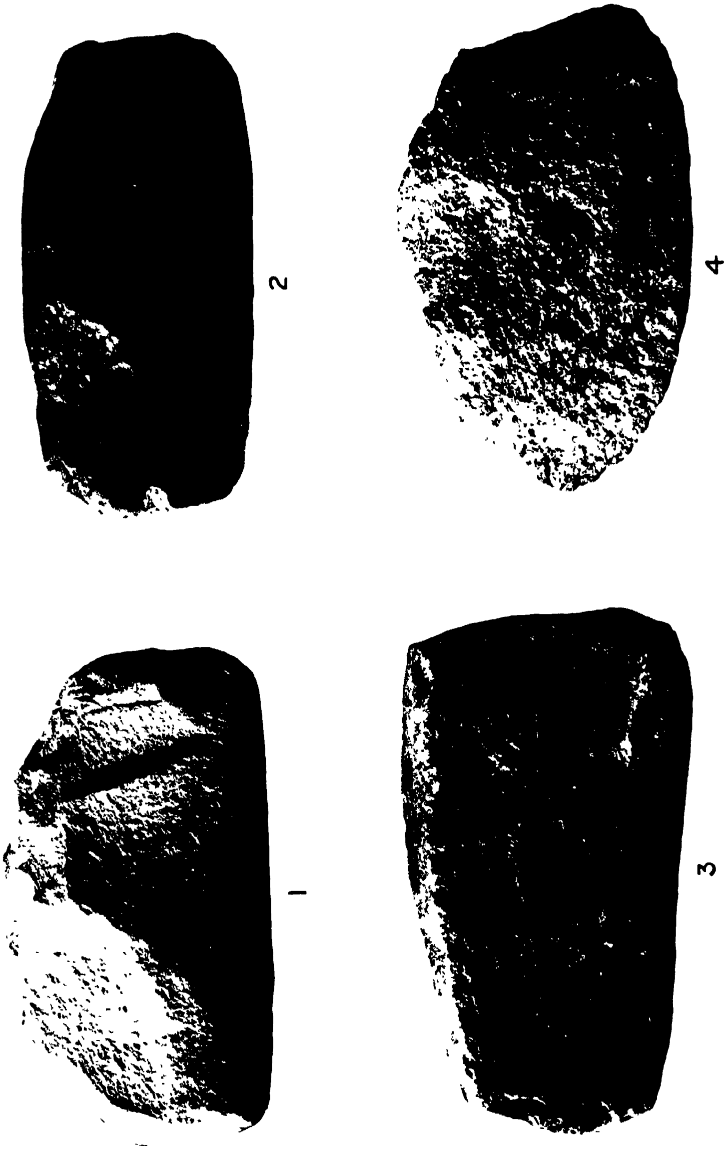

G. C. CLUTTON, photo.

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G. C. CLUTTON, photo.

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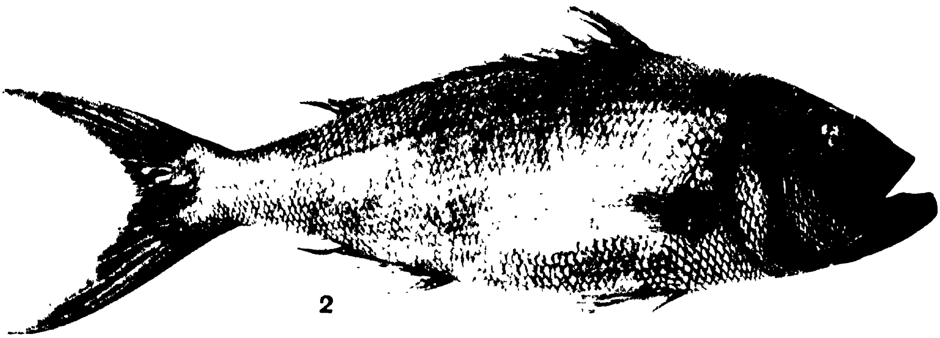

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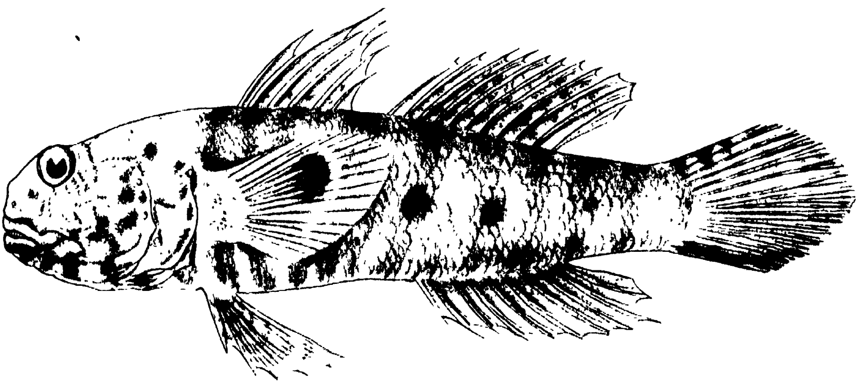

G. C. Clutton (1-2), photo.
Joyce K. Allan (3), del.

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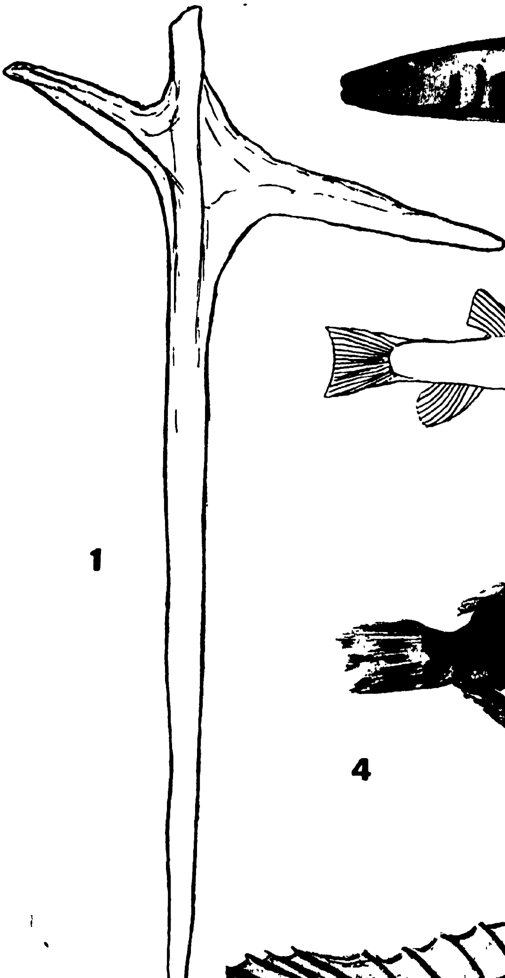

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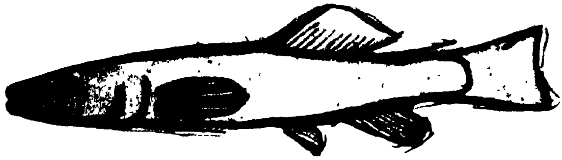

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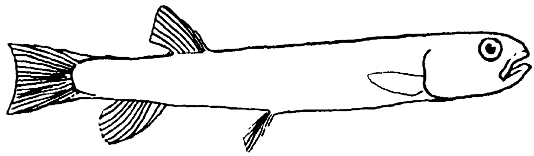

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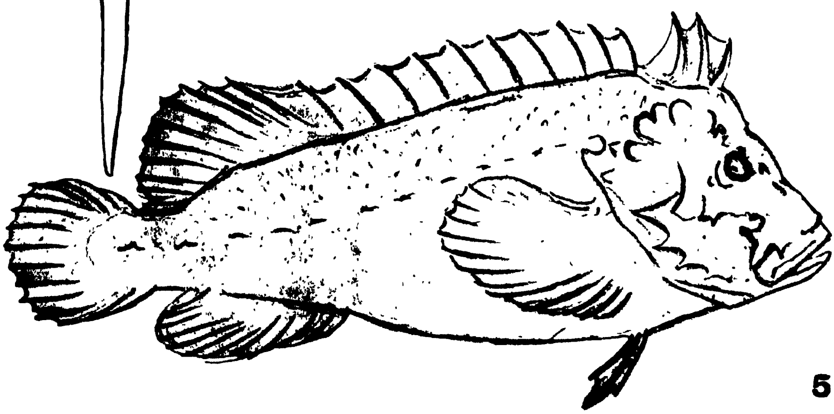

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JOYCE K. ALLAN (1), C. TATE REGAN (2), DENE B. FRY (3), and A. R. McCULLOCH, (4-5), del.

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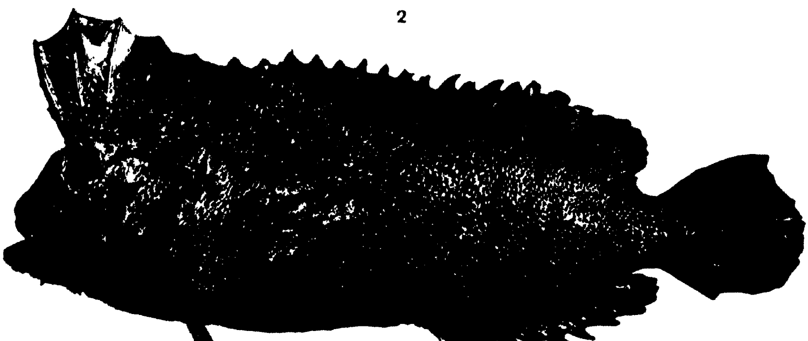

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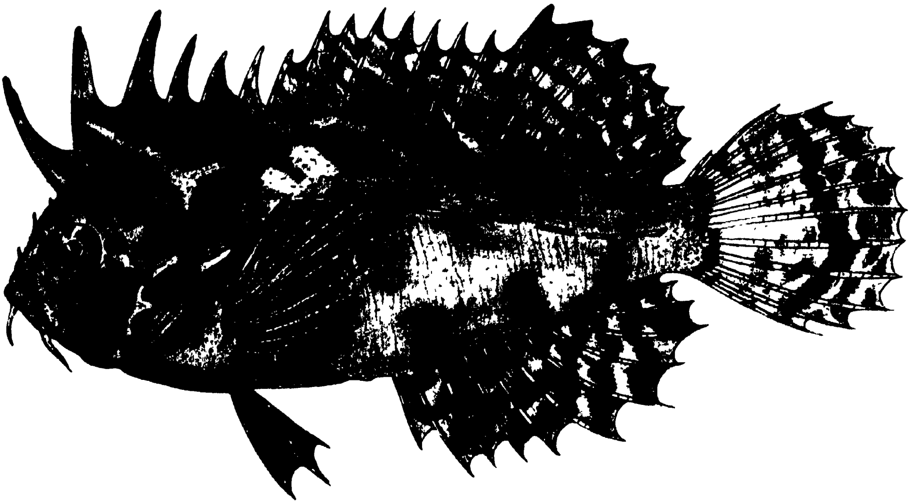
G. C. CLUTTON (1-2), T. C. ROUGHLEY (3), photo.



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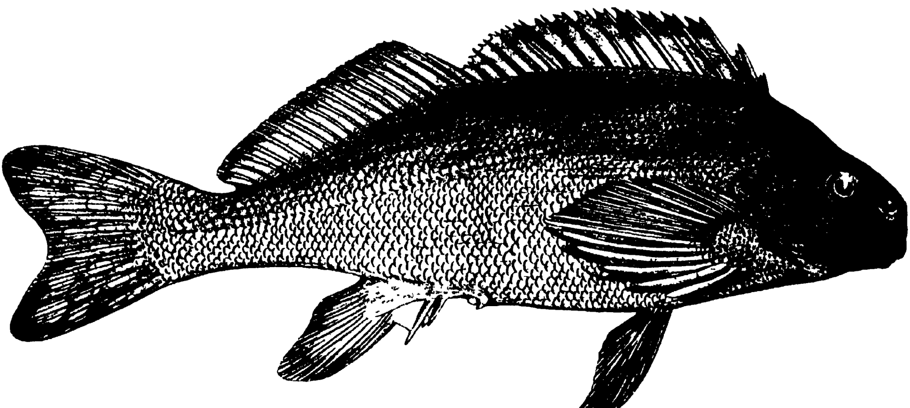

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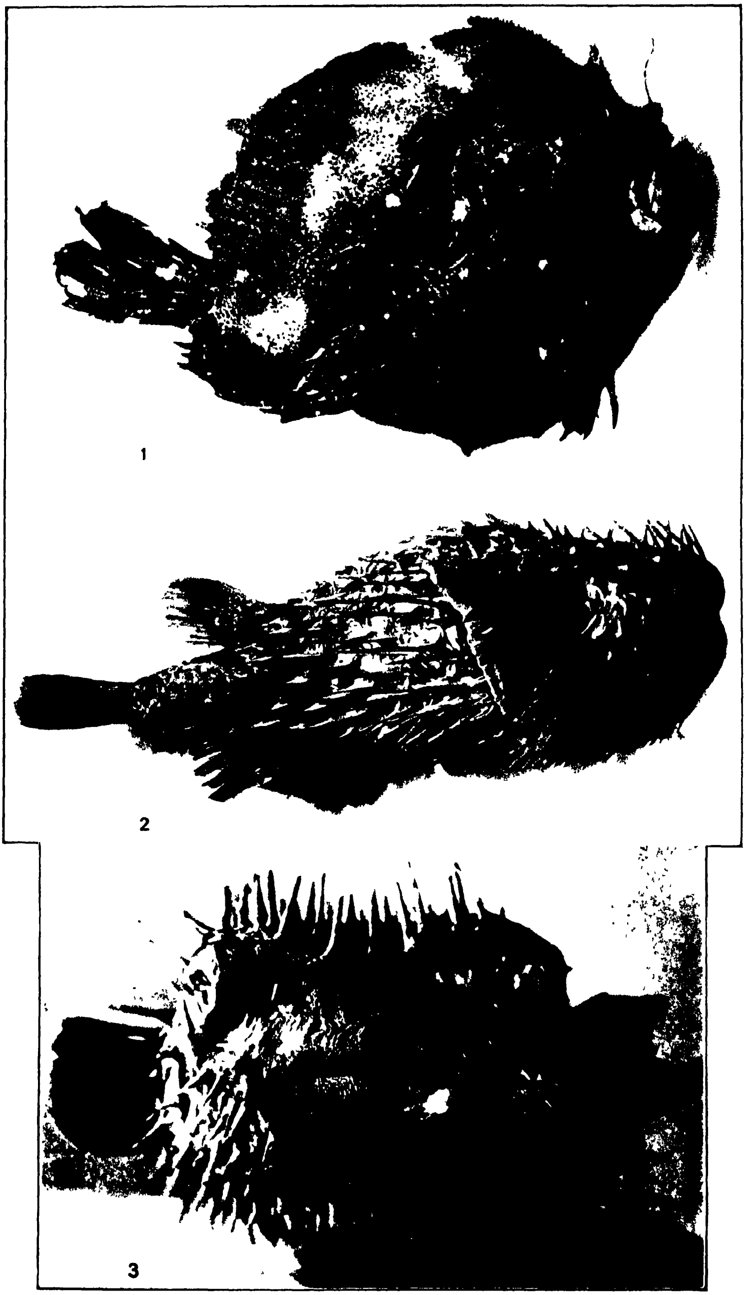
G. P. WHITLEY, del.



G. C. Clutton, photo.

THE FOOD OF BIRDS FROM SOUTH-WESTERN NEW SOUTH WALES.

By Keith C. McKeown

(Assistant Entomologist, the Australian Museum, Sydney.)

This paper contains the results of a detailed examination of the stomachs and crops of one hundred and eighteen birds of sixty-two species collected in south-western New South Wales during the months of September and October, 1932. The skins of the birds are, in most cases, preserved in the Australian Museum.

The fact that entomological collections were made in the same localities and seasons in which the birds were shot has greatly facilitated the work of investigation, since it has enabled fairly definite identifications to be made, in many cases, from quite small insect fragments. Where any doubt has existed with reference to any identification, such determinations are queried. In most of the stomachs of insectivorous birds examined there was usually a considerable quantity of very finely comminuted insect remains. These it was impossible to allocate to their particular orders, excepting beetle fragments, which, resisting the action of the digestive juices better than those of other groups, were usually quite recognizable as such, although too fragmentary for identification even of the family to which they belong. The large number of stomachs listed as containing miscellaneous Coleoptera is due mainly to this, but, while it is practically certain that insects of other orders were represented, it was impossible to indicate them in the classified lists of foods.

Throughout the investigation it became increasingly apparent that to obtain an adequate knowledge of the food of any bird, a large series of stomachs is necessary, since single stomachs may give a possibly erroneous idea of the food. This is instanced by a comparison of specimens procured from the same locality and at the same time. Of three Straw-necked Ibis (*Threskiornis spinicollis*) from Springfield Station, Eurolie, and all obtained at the same time, one contained a centipede, spider, mole cricket, Lepidopterous remains, Coleoptera and grasshoppers: the second, a large quantity of young grasshoppers only, while the third was entirely empty, with the exception of one small beetle elytron. In the case of two Boobook Owls (*Ninox boobook*) shot near the Agricultural High School, Yanco, at 9.30 on the same night and within a few yards of one another, one contained a large number of mature Bugong Moths (*Agrotis infusa*), while the other was full of cutworms and a longicorn beetle.

There can be no doubt that in economically assessing the value of any individual species of bird, it is necessary to examine the stomachs of a large number of specimens, preferably several hundred, in detail. To enable later investigators to add their results to the existing data and to compare them critically, it is necessary that the stomach contents of individual birds should be set out in detail, since a summary of the food of a species will not necessarily indicate the proclivity of individuals of that species to feed on any particular food or foods.

Birds shot in the vicinity of cultivation will naturally contain a greater proportion of food of economic importance to the farmer and orchardist, those in timbered country to the forester, and those taken in open grass-land to the pastoralist. Much, again, will depend upon the food available at any particular season: and the relative accessibility of any particular food at the time the bird

was shot must always be taken into consideration in any investigation of the stomach contents and the food of a bird. The time of day is also a factor to be considered, since birds usually feed mainly in the early morning and evening.

In listing the stomach contents it has been found preferable to give full details of the foods found, since any attempt to state them as percentages of the whole tends to give an erroneous impression, as one specimen of a large insect may form a large percentage of the total bulk as against a similar percentage made up of numerous individuals of some small insect.

A field examination of the stomach contents of birds will frequently give very different results to one carried out under laboratory conditions, and has in many instances to be qualified by such a later detailed examination. It will, therefore, be seen that any hasty examination of the contents of a bird's stomach, by farmers and others unqualified or unequipped for the work, will produce quite erroneous results. In the case of observations in the field, unsupported by a *post mortem*, unless under exceptional conditions, with the aid of field glasses, it is quite impossible to obtain any sound data as to what a bird is feeding upon, and such observations are usually quite valueless. An observer may be quite definite that he has seen a bird eat a certain food, but a careful examination of its stomach contents will frequently prove such a food to be completely absent.

For convenience of reference it may be mentioned that the following species of birds from south-western New South Wales are dealt with by Cleland[1] :—

Cacatua roseicapilla, Yanco, four specimens, 19th December, 1914, page 48.
Barnardius barnardi, Wilbriggie, 7th October, 1912, page 50.
Acanthiza pyropyga, Wilbriggie, 7th October, 1912, page 62.
Pachycephala rufiventris, Wilbriggie, 7th October, 1912, page 71.
Aphelocephala leucopsis, Wilbriggie, 7th October, 1912, page 73.
Corvus coronoides, Yanco, 19th December, 1914, page 91.

I have included in this paper details of the stomach contents of seven specimens of the imported Starling (*Sturnus vulgaris*) collected in and around orchards on the Yanco Irrigation Area during 1927.

I am greatly indebted to Messrs. J. R. Kinghorn, Ornithologist, and W. Barnes, Assistant Taxidermist, Australian Museum, Sydney, for the collection of the bird stomachs for examination, and their co-operation and assistance while at Yanco, and especially to Mr. Kinghorn for his valuable advice and assistance throughout the preparation of this paper, and to other officers of the Australian Museum staff for identification of material during the course of the investigation. My thanks are also due to Mr. E. Cheel, Botanical Gardens, Sydney, for the identification of the seeds.

NOTES ON INSECTS, Etc., OF ECONOMIC IMPORTANCE EATEN BY BIRDS.

Psyllidæ.—These small insects infest the leaves of the eucalypts, sucking up the sap and discharging the surplus and forming it into protective shields, or lerp-scales of sugary matter. W. W. Froggatt, in " Forest Insects of Australia, (1923)," page 9, states : " When these insects are numerous large areas of forest, particularly eucalypts, are so badly infested that all the foliage becomes discoloured through the sap being sucked up, the leaves dry up and fall, and thousands of trees

[1] Cleland and others.—N.S W. Agricultural Department, Science Bulletin, 15 July, 1918.

become defoliated, and look in a very unhealthy condition, or as if they had been ringbarked. If suitable climatic conditions carry on the successive generations of lerp insects through several years, this constant infestation causes the tops of the gum-trees to die back, and the forest rangers state that the timber becomes of an inferior quality to that of uninfested trees."

Longicorn beetle (*Phoracantha recurva*).—The commonest and most widely distributed species of the genus, it would probably become a formidable forest pest, were it not for the large number of parasites which prey upon it. This insect was accidentally introduced into South Africa with timber some years ago, and being free from its natural enemies, attacked the eucalypts that have been planted extensively in many parts of Africa.

Steel-blue Sawfly (*Perga dorsalis*).—The larvæ of these large wasps frequently defoliate the seedlings and young trees of the Red-gum (*Eucalyptus rostrata*) in the forest areas on the Murrumbidgee River frontage near Yanco and towards Hay, and repeated defoliations stunt the growth of the subsequent tree.

Cup Moth (*Doratifera vulnerans*).—The stinging larvæ of the Cup Moth are usually present in very large numbers throughout the forest areas of the Murrumbidgee River frontage, defoliating the Red-gum saplings and small trees, frequently stripping them of every leaf before pupating in their rounded cocoons on the limbs and trunk. During September and October, 1932, the larvæ were in immense numbers, and it was impossible to pass through the trees without becoming severely stung by the hairs of the caterpillars. In those areas where the infestation was heaviest the constant patter of their excreta falling upon the dead leaves on the ground below sounded like rain during a sharp shower.

Weevils (*Curculionidæ*).—Important forest pests, the legless larvæ of some species destroying foliage, while in others they tunnel in timber. Some of the adult weevils attack the opening leaf buds. A number of species have turned their attention to fruit trees, and have become serious orchard pests.

Paropsis spp. (*Chrysomelidæ*).—These beetles and their slug-like larvæ frequently defoliate eucalypts in forest areas, and are sometimes of considerable importance to the forester.

Plague Locusts or Grasshoppers (*Calaturia terminifera*).—Grasshoppers are perhaps the most serious insect pest which the pastoralist has to combat. The eggs are deposited in the hard patches on the so-called "scalded plains" of the interior and south-west New South Wales, where the young hoppers hatch in the spring in great swarms, destroying herbage and crops as they travel. The grasshopper problem is one of paramount importance to the country, and any birds preying upon them, especially in their young stages, are of the utmost value and should be rigidly protected.

Cutworms (*Noctuidæ*).—The larvæ of a number of species of Noctuid moths are popularly known as "cutworms," and are serious pests on the farm and in the garden, cutting off the young plants of vegetable and field crops at ground level and frequently causing considerable loss.

Bugong Moth (*Agrotis infusa*).—The larvæ of this, among other species of the genus, constitute the vast swarms of caterpillars which appear in some seasons, and are known as "caterpillar plagues." These caterpillars, travelling on an extended face, destroy all crops and grass which they encounter on their march.

Bees (*Apis mellifica*).—Any birds destroying bees in the vicinity of apiaries may prove of considerable economic importance, but in the bush their attacks would be of little importance, and other insects destroyed outweigh the value of any bees consumed.

Crayfish or "Yabbies" (*Parachæraps bicarinatus*).—Crayfish constitute a very serious pest in irrigation areas from their habit of tunnelling in the banks and bottoms of earth irrigation channels, causing considerable loss of water and consequent damage to adjoining fruit-growing land by seepage. The crayfish problem is becoming one of increasing importance, and it appears impossible, with our present knowledge of the question, to evolve practical measures for their control, short of concreting the channels.

Mice (*Mus musculus*).—These are serious pests of crops, stored grain, hay, etc., and are responsible from year to year for considerable losses, and when, owing to the destruction of their natural enemies or other causes, they appear as "mouse plagues," the damage may amount to many thousands of pounds in value.

Birds.—A number of species of small birds, sparrows, starlings, and others, cause considerable damage to fruit and grain crops on the Murrumbidgee Irrigation Areas, and are responsible for important losses every year; in the destruction of these birds hawks and owls do work of outstanding economic value, but their services in this respect are offset by the destruction of many small insectivorous birds.

SPECIES OF BIRDS ARRANGED ACCORDING TO THEIR DIETS.

Mammals.

Mice, etc.—

Threskiornis molucca (Australian White Ibis).
Elanus axillaris (Australian Black-shouldered Kite).

Birds.

Falco longipennis (Little Falcon).

Fish.

Phalacrocorax ater (Little Black Cormorant).

Beetles (Coleoptera).

Water Beetles (Dytiscidæ, etc.)—

Erythrogonys cinctus (Red-kneed Dotterel).
Charadrius melanops (Black-fronted Dotterel).
Threskiornis molucca (Australian White Ibis).
Threskiornis spinicollis (Straw-necked Ibis).
Notophoyx novæ-hollandiæ (White-fronted Heron).
Halcyon sanctus (Sacred Kingfisher).

Carab Beetles (Carabidæ)—

Charadrius melanops (Black-fronted Dotterel).
Tringa stagnatilis (Marsh-Sandpiper).
Threskiornis spinicollis (Straw-necked Ibis).
Pomatostomus temporalis (Grey-crowned Babbler).
Artamus leucorhynchus (White-breasted Wood Swallow).

Weevils (Curculionidæ)—
Himantopus leucocephalus (White-headed Stilt).
Threskiornis molucca (Australian White Ibis).
Threskiornis spinicollis (Straw-necked Ibis).
Colluricincla harmonica (Grey Shrike-thrush).
Pomatostomus temporalis (Grey-crowned Babbler).
Cincloramphus mathewsi (Rufous Song Lark).
Meliphaga penicillata (White-plumed Honey-eater).

Scarab Beetles (Scarabaeidæ)—
Threskiornis spinicollis (Straw-necked Ibis).
Pomatostomus temporalis (Grey-crowned Babbler).
Myzantha melanocephala (Noisy Miner).

Longicorn Beetles (Cerambycidæ)—
Ninox boobook (Boobook Owl).

Tenebrionid Beetles (Tenebrionidæ)—
Halcyon sanctus (Sacred Kingfisher).
Pomatostomus temporalis (Grey-crowned Babbler).
Cincloramphus mathewsi (Rufous Song Lark).

Paropsis spp.—
Halcyon sanctus (Sacred Kingfisher).
Pachycephala rufiventris (Rufous Whistler).
Colluricincla harmonica (Grey Shrike-thrush).
Coracina novæ-hollandiæ (Black-faced Cuckoo-shrike).
Myzantha melanocephala (Noisy Miner).

Click Beetles (Elateridæ)—
Halcyon sanctus (Sacred Kingfisher).
Pomatostomus temporalis (Grey-crowned Babbler).
Cincloramphus mathewsi (Rufous Song Lark).
Corcorax melanoramphus (White-winged Chough).

Chrysomelid Beetles (Chrysomelidæ)—
Colluricincla harmonica (Grey Shrike-thrush).
Lalage tricolor (White-winged Triller).
Myzantha melanocephala (Noisy Miner).

Miscellaneous Beetles—
Charadrius melanops (Black-fronted Dotterel).
Himantopus leucocephalus (White-headed Stilt).
Threskiornis molucca (Australian White Ibis).
Threskiornis spinicollis (Straw-necked Ibis).
Notophoyx novæ-hollandiæ (White-fronted Heron).
Halcyon sanctus (Sacred Kingfisher).
Eopsaltria australis (Southern Yellow Robin).
Pachycephala rufiventris (Rufous Whistler).
Colluricincla harmonica (Grey Shrike-thrush).
Coracina novæ-hollandiæ (Black-faced Cuckoo-shrike).
Pomatostomus temporalis (Grey-crowned Babbler).
Aphelocephala leucopsis (Western Whiteface).

Miscellaneous Beetles—*continued.*

Cincloramphus mathewsi (Rufous Song Lark).
Artamus cyanopterus (Dusky Wood Swallow).
Climacteris picumnus (Brown Tree-creeper).
Meliphaga penicillata (White-plumed Honey-eater).
Myzantha melanocephala (Noisy Miner).
Philemon corniculatus (Noisy Friar-bird).
Corcorax melanoramphus (White-winged Chough).

Moths (Lepidoptera).

Larvæ of Cup-moths (*Doratifera vulnerans*)—

Cacomantis osculans (Black-eared Cuckoo).
Eopsaltria australis (Southern Yellow Robin).
Pachycephala rufiventris (Rufous Whistler).
Colluricincla harmonica (Grey Shrike-thrush).
Coracina novæ-hollandiæ (Black-faced Cuckoo-shrike).

Cut Worms (Noctuidæ)—

Threskiornis spinicollis (Straw-necked Ibis).
Ninox boobook (Boobook Owl).

Miscellaneous Moths.

Halcyon sanctus (Sacred Kingfisher).
Colluricincla harmonica (Grey Shrike-thrush).
Coracina novæ-hollandiæ (Black-faced Cuckoo-shrike).
Lalage tricolor (White-winged Triller).
Pomatostomus temporalis (Grey-crowned Babbler).
Cincloramphus mathewsi (Rufous Song Lark).
Meliphaga penicillata (White-plumed Honey-eater).
Myzantha melanocephala (Noisy Miner).
Entomyzon cyanotus (Blue-faced Honey-eater).

Bees, Ants, Wasps, etc. (Hymenoptera).

Ants.

Tringa stagnatilis (Marsh-Sandpiper).
Petroica goodenovii (Red-capped Robin).
Colluricincla harmonica (Grey Shrike-thrush).
Cincloramphus mathewsi (Rufous Song Lark).
Artamus leucorhynchus (White-breasted Wood-swallow).
Climacteris picumnus (Brown Tree-creeper).
Philemon corniculatus (Noisy Friar-bird).

Native Bees (Apidæ)—

Halcyon sanctus (Sacred Kingfisher).
Eopsaltria australis (Southern Yellow Robin).
Philemon corniculatus (Noisy Friar-bird).

Hive Bee (*Apis mellifica*).

Merops ornatus (Rainbow Bird).
Artamus leucorhynchus (White-breasted Wood-swallow).

Wasps (Chrysididæ).

Artamus leucorhynchus (White-breasted Wood-swallow).

Saw-Flies (*Perga dorsalis*).

Meliphaga penicillata (White-plumed Honey-eater).
Corcorax melanoramphus (White-winged Chough).

Grasshoppers, etc. (Orthoptera).

Grasshoppers or Plague Locusts (Acridiidæ).

Zonifer tricolor (Banded Plover).
Threskiornis spinicollis (Straw-necked Ibis).
Notophoyx novæ-hollandiæ (White-fronted Heron).
Falco cenchroides (Nankeen Kestrel).
Artamus leucorhynchus (White-breasted Wood-swallow).

Crickets (Gryllotalpidæ).

Threskiornis spinicollis (Straw-necked Ibis).
Falco cenchroides (Nankeen Kestrel).

Cockroaches (Blattidæ).

Colluricincla harmonica (Grey Shrike-thrush).

Earwigs (Forficulidæ).

Cincloramphus mathewsi (Rufous Song Lark).

Dragon-flies (Odonata).

Threskiornis molucca (Australian White Ibis).
Biziura lobata (Musk Duck).
Halcyon sanctus (Sacred Kingfisher).
Artamus leucorhynchus (White-breasted Wood-swallow).

Plant Bugs, etc (Hemiptera).

Aquatic Bugs (Corixidæ, etc.).

Charadrius melanops (Black-fronted Dotterel).
Biziura lobata (Musk Duck).

Tree-hoppers, etc. (Membracidæ, Jassidæ, etc.).

Cincloramphus mathewsi (Rufous Song Lark).

Plant-bugs (Pentatomidæ).

Meliphaga penicillata (White-plumed Honey-eater).
Corcorax melanoramphus (White-winged Chough).

Psyllidæ.

Pachycephala rufiventris (Rufous Whistler).
Pardalotus striatus (Striated Pardalote).
Meliphaga penicillata (White-plumed Honey-eater).
Entomyzon cyanotus (Blue-faced Honey-eater).
Philemon corniculatus (Noisy Friar-bird).
Philemon citreogularis (Little Friar-bird).

Flies (Diptera).

Crane-flies (Tipulidæ).

Philemon corniculatus (Noisy Friar-bird).

Miscellaneous Flies.

Charadrius melanops (Black-fronted Dotterel).
Anas superciliosus (Black Duck).
Halcyon sanctus (Sacred Kingfisher).
Artamus leucorhynchus (White-breasted Wood-swallow).
Artamus cyanopterus (Dusky Wood-swallow).
Myzantha melanocephala (Noisy Miner).
Philemon corniculatus (Noisy Friar-bird).

Spiders (Araneidae).

Threskiornis spinicollis (Straw-necked Ibis).
Falco cenchroides (Nankeen Kestrel).
Halcyon sanctus (Sacred Kingfisher).
Pachycephala rufiventris (Rufous Whistler).
Pomatostomus temporalis (Grey-crowned Babbler).
Cincloramphus mathewsi (Rufous Song Lark).
Artamus leucorhynchus (White-breasted Wood-swallow).

Centipedes (Chilopoda).

Threskiornis spinicollis (Straw-necked Ibis).
Falco cenchroides (Nankeen Kestrel).
Colluricincla harmonica (Grey Shrike-thrush).

Molluscs (Mollusca).

Biziura lobata (Musk Duck).

Crayfish (Yabbies), etc. (Crustacea).

Crayfish (Yabbies).

Microcarbo melanoleucus (Little Pied Cormorant).
Threskiornis molucca (Australian White Ibis).
Biziura lobata (Musk Duck).

Miscellaneous Crustacea.

Notophoyx novæ-hollandiæ (White-fronted Heron).
Halcyon sanctus (Sacred Kingfisher).

Weed Seeds, etc.

Geopelia placida (Peaceful Dove).
Querquedula gibberifrons (Grey Teal).
Psephotus hæmatonotus (Red-backed Parrot).

Trefoil and other Leguminous Seeds, etc.

Phaps chalcopterus (Common Bronzewing).
Ocyphaps lophotes (Crested Pigeon).
Chenonetta jubata (Maned Goose).
Querquedula gibberifrons (Grey Teal).
Polytelis swainsoni (Green Leek).
Platycercus flaveolus (Yellow Rozella).

(?) Mistletoe (Loranthus).

?Barnardius barnardi (Ringneck Parrot).

Cultivated Grain.

Polytelis swainsoni (Green Leek).

Grass Seeds.

Geopelia placida (Peaceful Dove).
Porphyrio melanotus (Bald Coot).
Aphelocephala leucopsis (Eastern Whiteface).
Tæniopygia castanotis (Zebra Finch).
Struthidea cinerea (Apostle Bird).
Cacatua galerita (White Cockatoo).
Leptolophus hollandicus (Cockatoo Parrot).
Polytelis swainsoni (Green Leek).
Platycercus flaveolus (Yellow Rozella).
Barnardius barnardi (Ringneck Parrot).

Miscellaneous Vegetable Matter.

Coturnix pectoralis (Stubble Quail).
Gallinula tenebrosa (Dusky Moorhen).
Porphyrio melanotus (Bald Coot).
Anas superciliosus (Black Duck).
Querquedula gibberifrons (Grey Teal).
Corcorax melanorhampus (White-winged Chough).
Polytelis swainsoni (Green Leek).
Psephotus hæmatonotus (Red-backed Parrot).

CONTENTS OF STOMACHS.

Coturnix pectoralis Gould, Stubble Quail.

Tubbo Station, Eurolie, 18 October, 1932 (p.m.), ♂.—*Vegetable matter*: A little unidentifiable vegetable matter. *Miscellaneous*: Sand.

Geopelia placida Gould, Peaceful Dove.

(*a*) Murrumbidgee River, Yanco, New South Wales, 27 September, 1932 (p.m.). ♀ (0·33155).—*Seeds*: *Digitaria* sp. (Gramineæ). *Polygonum* spp. (Polygonaceæ), the latter only in small quantity.

(*b*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33156).—*Crop. Seeds*: Total contents of crop were seeds of *Stellaria* sp. (Caryophyllaceæ). *Stomach. Seeds*: Small quantity of the same seeds as in crop. *Miscellaneous*: Sand.

(*c*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33157).—*Crop. Seeds*: A very large quantity of seeds of *Solanum* sp. (Solanaceæ), about 96 per cent. of the whole, together with other seeds (? gen. et sp.). *Stomach*: The same seeds and in about the same proportions as in the crop.

Phaps chalcoptera Latham, Common Bronzewing.

Near Yanco Agricultural High School, Yanco, 30 September, 1932 (p.m.) ♀ (0·33190).—*Seeds*: 75 per cent. seeds of *Medicago* sp., (Leguminosæ); 25 per cent. seeds (? gen. et sp.).

Ocyphaps lophotis Temminck, Crested Pigeon.

Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33188).—*Stomach. Vegetable matter*: A few leaves and seeds of *Medicago* sp. (Leguminosæ). *Miscellaneous*: Stomach filled with coarse quartz gravel. *Crop. Vegetable matter*: Crop almost empty, a few *Medicago* leaves only.

Gallinula tenebrosa Gould, Dusky Moorhen.

Near Yanco Agricultural High School, Yanco, 1 October, 1932 (a.m.), ♀ (0·33116).—*Vegetable matter*: A little fibrous vegetable matter. *Miscellaneous*: Mud.

Porphyrio melanotus Temminck, Eastern Swamp Hen (Bald Coot).

(*a*) Canal at Yanco Agricultural High School, Yanco, 29 September, 1932 (p.m.), ♀ (0·33112).—*Seeds*: Stomach filled with *Digitaria* sp. (Graminæ). *Miscellaneous*: Clean sand.

(*b*) Yanco Agricultural High School, Yanco, 29 September, 1932 (p.m.), ♀ (0·33113).—*Vegetable matter*: A large quantity of practically colourless and very coarse vegetable fibre. *Miscellaneous*: Gravel.

(*c*) Five Bough Swamp, Leeton, 3 October, 1932 (a.m.), ♂ (0·33114).—*Vegetable matter*: A quantity of unidentifiable green vegetable matter. *Miscellaneous*: A little fine sand.

(*d*) Five Bough Swamp, Leeton, 3 October, 1932 (a.m.), ♀ (0·33115).—*Vegetable matter*: A quantity of fibrous vegetable matter. *Miscellaneous*: Gravel.

Fulica atra Linnæus, Coot.

Five Bough Swamp, Leeton, 6 October, 1932, ♀ (0·33117).—*Vegetable matter*: A quantity of fibrous vegetable matter. *Miscellaneous*: Sand.

Podiceps ruficollis Vroeg, Little Grebe (Dabchick).

Five Bough Swamp, Leeton, 3 October, 1932 (p.m.), ♀ (0·33191).—*Vegetable matter*: A little unidentifiable vegetable matter. *Miscellaneous*: Gravel.

Phalacrocorax ater Lesson, Little Black Cormorant.

Five Bough Swamp, Leeton, 6 October, 1932, ♂ (0·33099).—*Fish*: Bones of a small fish (unidentifiable).

Microcarbo melanoleucus Vieillot, Little Pied Cormorant.

Five Bough Swamp, Leeton, 6 October, 1932, ♂ (0·33098).—*Crustacea*: Remains of a large crayfish (*Parachaeraps bicarinatus*). *Remarks*: Five small intestinal worms.

Erythrogonys cinctus Gould, Red-kneed Dotterel.

Lake Eurolie, 5 October, 1932 (a.m.), ♀ (0·33194).—*Coleoptera*: 6 small water beetles (*Bidessus* sp.) and finely broken remains of beetles. *Miscellaneous Insects*: Unidentifiable insect remains. *Miscellaneous*: Sand.

Lobibyx novae-hollandiae Stephens, Australian Spur-winged Plover.

Lake Eurolie, 21 October, 1932 (p.m.), ♂ (0·33192).—*Miscellaneous*: A small quantity of mud; a number of pebbles and a few shell fragments.

Zonifer tricolor Vieillot, Banded Plover.

Tubbo Station, Darlington Point, 18 October, 1932 (a.m.), ♀ (0·33193).—*Orthoptera*: Remains of immature grasshoppers (*Calataria terminifera*) *Miscellaneous*: Coarse gravel.

Charadrius melanops Vieillot, Black-fronted Dotterel.

(*a*) Swamp, Agricultural High School, Yanco, 29 September, 1932 (p.m.), ♀ (0·33196).—*Coleoptera*: 3 aquatic beetle larvæ (? *Hydrophilus* sp.), and broken remains of beetles. *Diptera*: 8 aquatic larvæ of a midge (Chironomid ?). *Miscellaneous Insects*: Some unidentifiable insect remains. *Miscellaneous*: Sand.

(*b*) Agricultural High School, Yanco, 29 September, 1932 (p.m.), ♂ (0·33197).—*Coleoptera*: Broken remains of beetles. *Diptera*: 5 fly larvæ, 4 Muscid and 1 Chironomid. *Miscellaneous Insects*: Unidentifiable insect remains.

(*c*) Five Bough Swamp, Leeton, 3 October, 1932 (p.m.), ♂ (0·33198).—*Coleoptera*: Larva of a water beetle (? genera). *Hemiptera*: Immature Water Boatman (Corixidæ). *Miscellaneous Insects*: Comminuted insect remains. *Miscellaneous*: Sand.

(*d*) Five Bough Swamp, Leeton, 3 October, 1932 (p.m.), ♂ (0·33199).—*Coleoptera*: Finely divided beetle remains, mainly Carabidæ (Genera *Sarothrocrepis* and *Ectroma*).

(*e*) Darlington Point, 17 October, 1932 (p.m.), ♂ (0·33200).—*Miscellaneous Insects*: Unidentifiable insect remains. *Miscellaneous*: Small pebbles and mud.

Himantopus leucocephalus Gould, White-headed Stilt.

(*a*) Gogeldrie, near Whitton, 17 October, 1932, ♀ (0·33118).—*Coleoptera*: 2 heads of weevils (Curculionidæ), and a large quantity of finely comminuted and unrecognisable beetle remains. *Miscellaneous*: Small quartz pebbles.

(*b*) Lake Eurolie, 21 October, 1932, (p.m.), ♀ (0·33119).—*Miscellaneous*: A few coarse pebbles and a little mud.

(*c*) Lake Eurolie, 21 October, 1932, (p.m.), ♂ (0·33120). *Animal remains*: A quantity of unidentifiable animal matter. *Miscellaneous*: Mud and gravel.

Tringa stagnatilis Bechstein, Marsh-Sandpiper.

Five Bough Swamp, Leeton, 3 October, 1932 (p.m.), ♂ (0·33195).—*Coleoptera*: Finely broken beetle remains, mostly ? Carabidæ. *Hymenoptera*: Head of a green-head Ant (*Chalcoponera metallica*). *Miscellaneous Insects*: Finely comminuted fragments.

Threskiornis molucca Cuvier, Australian White Ibis.

(*a*) Swamp near Yanco, 30 September, 1932 (p.m. night), ♀ (0·33088).—*Coleoptera*: 1 weevil (*Phalidura* sp.—Curculionidæ), and other beetle fragments. *Crustacea*: 16 gastroliths of crayfish (Yabbies), *Parachœraps bicarinatus*. *Miscellaneous* Fragments of animal matter.

(*b*) Five Bough Swamp, Leeton, 4 October, 1932 (p.m.), ♂ (0·33089).—*Crustacea:* 5 entire Crayfish or Yabbies (*Parachaeraps bicarinatus*), 4 partially digested Crayfish, and 42 gastroliths. *Mammals :* Bones of a small mammal (? mouse or small rat).

(*c*) Canal bank near Leeton, 5 October, 1932 (p.m.), ♀ (0·33090) *Coleoptera:* 1 large water beetle (*Hydrophilus* sp.), and 5 larvæ. *Odonata :* 1 Anisopterid dragonfly larva. *Crustacea :* 19 crayfish or Yabbies (small to medium), intact (*Parachaeraps bicarinatus*), and 18 gastroliths. *Miscellaneous :* Unidentified animal matter.

Threskiornis spinicollis Jameson, Straw-necked Ibis.

(*a*) Lake Eurolie, 15 October, 1932 (a.m.), ♂ (0·33091).—*Coleoptera :* 11 weevils (Phalidura sp.—Curculionidæ), 1 water beetle (*Hydrophilus* sp.). *Orthoptera :* A quantity of finely comminuted young grasshoppers (*Calataria terminifera*). *Miscellaneous Insects :* A large section of the ? epidermis of a large pupa (? *Zeuzera*). *Miscellaneous :* Stomach filled with thick glutinous mud.

(*b*) Springfield Station, Eurolie, 17 October, 1932, ♂ (0·33092).—*Coleoptera :* 1 Carab beetle (*Catadromus ? latro*), 1 Carab beetle (*Carenum* sp.), 4 heads of very large beetle larvæ (? Scarabæidæ—Curl Grubs), together with unidentifiable beetle remains, possibly Carabidæ. *Lepidoptera :* 2 large moth larvæ (? Cutworms). *Orthoptera :* 1 oz. of finely divided remains of young grasshoppers (*Calataria terminifera*), 1 immature Mole Cricket (*Gryllotalpa* sp.). *Araneidæ :* 1 large spider. *Chilopoda :* 1 Centipede. *Miscellaneous :* 14 pebbles ranging up to ¼ oz. in weight.

NOTE :—An actual count of the more or less intact examples of Plague Locusts or Grasshoppers (*Calataria terminifera*) gave 100 to about ⅛th of the total bulk of their remains, but the remainder were in an advanced stage of digestion, consequently the total was much greater than the proportion would indicate.

(*c*) Springfield Station, Eurolie, 17 October, 1932, ♀ (0·33093).—*Orthoptera :* 3½ oz. of finely divided and partly digested remains of young grasshoppers (*Calataria terminifera*).

(*d*) Springfield Station, Eurolie, 17 October, 1932, ♀ (0·33094).—*Coleoptera :* 1 small beetle elytron, otherwise entirely empty.

(*e*) Near Tubbo Station, Darlington Point, on road. 18 October, 1932 (a.m.), ♀ (0·33095).—*Orthoptera :* Stomach crammed with a solid mass of young grasshoppers (*Calataria terminifera*), 1⅜ oz. in weight.

Notophoyx novae-hollandiae Latham, White-fronted Heron.

(*a*) Eight miles west of Narrandera, 11 October, 1932 (a.m.), ♀ (0·33100).—*Coleoptera:* 107 heads of Gyrinid beetle larvæ, 62 complete and 4 partial Gyrinid beetles (*Macrogyrus latior*—Gyrinidæ), 1 large water beetle larva (*Hydrophilus* sp.). *Crustacea:* 6 Cypris-type Copepods (*Limnadopsis*).

(*b*) Marsh 8 miles west of Narrandera, 19 October, 1932 (a.m.), ♂, (juvenile).—*Coleoptera:* 2 entire water beetle larvæ (Dytiscidæ), 1 Gyrinid beetle (*Macrogyrus latior*), and fragmentary remains of water beetles (*Phyllhydrus* sp. *Berosus* sp., and Gyrinidæ). *Orthoptera:* Grasshoppers (*Calataria* sp.). *Crustacea:* 3 *Limnadopsis* sp. *Miscellaneous:* A large quantity of mud.

Chenonetta jubata Latham, Maned Goose (Wood-duck).

(*a*) Billabong 8 miles west of Narrandera, 12 October, 1932 (a.m.), ♀ (juvenile), (0·33110).—*Vegetable matter:* A small quantity of *Medicago* sp., or *Trifolium* sp. leaves (Leguminosæ). *Miscellaneous:* Sand.

(*b*) Marsh 8 miles west of Narrandera, 12 October, 1932 (a.m.), ♀, (juvenile), (0·33111).—*Vegetable matter:* Stomach crammed with leaves of *Medicago* sp. (Leguminosæ). *Miscellaneous:* Sand.

Anas superciliosus Gmelin, Black Duck.

(*a*) Marsh 8 miles west of Narrandera, 13 October, 1932 (p.m.), ♀ (0·33101).—*Miscellaneous Insects:* A very small quantity of unidentifiable insect remains. *Miscellaneous:* Coarse gravel and mud.

(*b*) Marsh 8 miles west of Narrandera, 14 October, 1932, ♀ (0·33102).—*Vegetable matter:* Unidentifiable fibrous vegetable matter. *Miscellaneous:* A quantity of mud and gravel.

(*c*) Billabong near Eurolie Bridge, Yanco, 18 October, 1932 (p.m.), ♀ (0·33103).—*Diptera:* One Dipterous larva. *Vegetable matter:* Partly digested and unidentifiable vegetable matter. *Miscellaneous:* Mud and sand.

Querquedula gibberifrons S. Muller, Grey Teal.

(*a*) Marsh 8 miles west of Narrandera, 13 October, 1932 (p.m.), ♀ (0·33105).—*Miscellaneous:* Sand only.

(*b*) Marsh 8 miles west of Narrandera, 13 October, 1932 (p.m.), ♂ (0·33106).—*Seeds:* One seed of *Cucumis myriocarpus* (Curcurbitaceæ). *Miscellaneous:* Mud and gravel.

(*c*) Marsh 8 miles west of Narrandera, 14 October, 1932, ♂ (0·33107).—*Seeds:* A few seeds of ? *Pultenia* sp. (Leguminosæ), and *Trifolium glomeratum*, (Leguminosæ). *Miscellaneous:* Mud.

(*d*) Marsh 8 miles west of Narrandera, 19 October, 1932 (a.m.), ♀ (0·33108).—*Miscellaneous:* Mud and gravel.

(*e*) Marsh, 8 miles west of Narrandera, 21 October, 1932, ♀ (0·33109).—*Vegetable matter:* A little fibrous vegetable matter. *Miscellaneous Insects:* Finely broken and unidentifiable insect remains. *Miscellaneous:* Mud and gravel.

Nyroca australis Eyton, Australian White-eyed Duck.

Five Bough Swamp, Leeton, 6 October, 1932 (p.m.), ♂ (0·33104).—*Miscellaneous:* Stomach empty except for a small quantity of gravel; no organic matter.

Biziura lobata Shaw, Musk Duck.

(*a*) Five Bough Swamp, Leeton, 3 October, 1932 (p.m.), ♂ (0·33096).—*Molluscs:* 4 *Planorbis* sp., 69 *Bullinus* sp. *Miscellaneous:* Mud and gravel. *Remarks:* 1 tapeworm.

NOTE:—Snails of the genus *Bullinus* are intermediate hosts of the Liver Fluke of Sheep.

(*b*) Five Bough Swamp, Leeton, 6 October, 1932 (p.m.), ♂ (juvenile), (0·33097).—*Odonata:* 2 Zygopterid dragon-fly larvæ. *Hemiptera:* 3 mature and 6 immature Water Boatmen (*Arctocorisa truncatipala*). *Crustacea:* Gastroliths of one large and one small Crayfish or Yabbie (*Parachæraps bicarinatus*). *Vegetable matter:* A small quantity of vegetable matter. *Miscellaneous:* Crammed with sand and gravel.

Elanus axillaris Latham, Australian Black-shouldered Kite.

Brobenah, near Leeton, 14 October, 1932 (p.m.), ♂ (0·33167).—*Mammals:* 2 mice (*Mus musculus*).

Falco longipennis Swainson, Little Falcon.

Near Yanco, 20 October, 1932 (p.m.), ♀ (juvenile) (0·33168).—*Birds:* 2 feet and beak of a Budgerigar (*Melopsittacus undulatus*), 4 feet of birds of two species (? gen. et spp.), and a quantity of feathers and broken bones. *Miscellaneous:* One grain of rice, evidently from the crop of one of the birds.

Falco cenchroides Vigors and Horsfield, Nankeen Kestrel.

Darlington Point, 17 October, 1932 (p.m.), ♀ (0·33166).—*Orthoptera:* 1 grasshopper elytra (*Calataria terminifera*), and the legs of a Cricket (*Gryllus* sp.). *Chilopoda:* 38 Centipedes (*Scolopendra morsitans*). *Araneidæ:* Legs of a Huntsman Spider (*Isopeda* sp.).

Ninox boobook Latham, Boobook Owl.

(*a*) Near Yanco Agricultural High School, Yanco, 30 September, 1932 (9.30 p.m.), ♂ (0·33169).—*Lepidoptera:* 51 Bugong Moths (*Agrotis infusa*) together with a quantity of partly digested remains, evidently of the same species.

(*b*) Near Yanco Agricultural High School, Yanco, 30 September, 1932 (9.30 p.m.), ♂ (0·33170). *Lepidoptera:* 15 larvæ of *Agrotis* sp. (Cutworms). *Coleoptera:* 1 Longicorn Beetle (*Phoracantha recurva*, —Cerambycidæ). *Miscellaneous Insects:* Unidentifiable insect remains.

Cacatua galerita Latham, White Cockatoo.

Springfield Station, Eurolie, 17 October, 1932, ♀ (0·33121).—*Seeds:* Seeds of *Erodium* sp. (Graminaceæ). *Miscellaneous:* Sand and coarse gravel.

Cacatua roseicapilla Vieillot, Galah.

Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♀ (0·33122).—*Crop. Seeds:* Completely filled with 1½ oz. seed (? gen. et sp.). *Insects, Lepidoptera:* 1 small larva (accidental). *Stomach:* Crammed with fine quartz gravel.

Leptolophus hollandicus Kerr, Cockatiel (Cockatoo Parrot).

Yanco Agricultural High School, Yanco, 4 October, 1932 (a.m.), ♂ (0·33123).—*Crop. Seeds:* Crammed with seeds of *Erodium* sp. (Graminaceæ). *Stomach. Miscellaneous:* Contained charcoal, sand, and well-digested remains of seed.

Polytelis swainsoni Desmarest, Green Leek (Superb Parrot).

(*a*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33124).—*Crop. Seeds:* Starchy matter of grain, and seeds (? gen. et sp.). *Vegetable matter:* Hundreds of yellow flowers of Milk Thistle? *Stomach. Seeds:* Finely divided particles of seed.

(*b*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33125).—*Seeds:* 30 seeds of *Erodium* sp. (Graminaceæ) *Vegetable matter:* A quantity of unidentifiable vegetable matter. *Miscellaneous:* A few rounded fragments of wood bearing a superficial resemblance to seeds.

(*c*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♀.—*Crop. Seeds:* Starchy matter from grain. Seeds of *Medicago* sp. Leguminaceæ. *Vegetable matter:* Leaflets of *Medicago* sp. Rudimentary buds ?. *Stomach:* A small quantity of fine sand and broken and partially digested seed.

Platycercus flaveolus Gould, Yellow Rosella.

(*a*) Murrumbidgee River, Yanco, 27 September, 1932 (p.m.), ♂ (0·33126).—*Seeds:* Broken fragments of seeds of *Erodium* sp. (Graminaceæ), and a few *Medicago* sp. seeds.

(*b*) Murrumbidgee River, Yanco, 27 September, 1932 (p.m.), ♂ (0·33127).—*Crop. Seeds:* *Medicago* sp., and *Erodium* sp., seeds. *Stomach. Seeds:* Seeds of *Medicago* sp. (Leguminosæ); and *Erodium* sp. (Graminaceæ). *Miscellaneous:* Sand.

(*c*) Murrumbidgee River, Yanco, 27 September, 1932 (p.m.), ♂ (0·33128).—*Seeds:* Seeds of *Medicago* sp. (Leguminosæ); and *Erodium* sp. (Graminaceæ).

(*d*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33129). *Crop. Seeds:* Crop partially filled with seeds (? spp.). *Stomach. Seeds:* A few seeds similar to those found in crop. *Miscellaneous:* Stomach practically filled with fine sand.

Barnardius barnardi Vigors and Horsfield, Ringneck (Mallee) Parrot.

(*a*) Murdering Sandhills, Narrandera, 14 October, 1932 (a.m.) ♂ (0·33130).—*Crop. Seeds:* 62 seeds of ? *Loranthus* sp. (Loranthaceæ); 100 seeds of *Erodium* sp. (Graminaceæ). A large quantity (about 80 per cent.) grass seed (? gen. et sp.). *Insects, Lepidoptera:* 10 larvæ and 2 pupæ (accidental). *Stomach:* Sand and charcoal, with fragments of grass seeds.

(*b*) Blue Gate Swamp, Yanco, 21 October, 1932 (a.m.), ♂ (0·33131).—*Crop. Seeds:* Seed (? gen. et sp.). *Stomach:* Sand and finely broken seed.

Psephotus hæmatonotus Gould, Red-backed Parrot.

(*a*) Yanco Agricultural High School, Yanco, 30 September, 1932, ♂ (0·33132). *Vegetable matter:* A little unidentifiable vegetable matter. *Miscellaneous:* Clean white sand and a quantity of small particles of charcoal.

(*b*) Macpherson Range, Leeton, 5 October, 1932 (p.m.), ♂ (0·33133).—*Crop. Seeds:* 1,400 seeds (? gen. et sp.). *Stomach:* 114 seeds (? gen. et. sp.). *Miscellaneous:* A quantity of small fragments of charcoal.

(*c*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33134).—*Stomach. Seeds:* Seeds of *Erodium* sp. (Graminaceæ). and unidentifiable seed remains. *Miscellaneous:* Stomach practically filled with very transparent quartz sand and a little charcoal.

(*d*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♀ (0·33135).—*Crop. Seeds:* Moderately filled with seeds of *Euphorbia* sp. (Euphorbiaceæ); and ? *Plantago* sp. (Plantaginaceæ). *Stomach:* Finely divided and partly digested, unidentifiable seed remains.

NOTE.—Paired with (*b*).

Dacelo gigas Boddært, Laughing Kookaburra.

Agricultural High School, Yanco, 4 October, 1932 (p.m.), ♂ (0·33171).—*Remarks:* Stomach entirely empty.

Halcyon sanctus Vigors and Horsfield, Sacred Kingfisher.

(*a*) Agricultural High School, Yanco, 29 September, 1932 (a.m.), ♀ (0·33154).—*Coleoptera:* 1 Tenebrionid beetle (*Pterohelæus* sp.,—Tenebrionidæ) *Paropsis* sp. (a large percentage of the total stomach contents. One Click beetle (Elateridæ), and a large quantity of finely broken fragments of beetles. *Lepidoptera:* 1 large moth larva, and hairs and scales from Lepidoptera. *Hymenoptera:* ? native bee. *Diptera:* Heads of two large flies (? *Rutilia* sp.). *Miscellaneous Insects:* Finely comminuted remains of insects. *Araneidæ:* 2 small spiders.

(*b*) Lake Eurolie, 15 October, 1932 (a.m.), ♀.—*Coleoptera:* 2 water beetle larvæ (*Hydrophilus* sp. ?). *Odonata:* Wings of Demoselle dragon-flies. *Miscellaneous Insects:* 2 aquatic larvæ (? Neuropterous). *Crustacea:* 3 Apus and remains of others. *Miscellaneous:* Much finely divided animal matter.

Merops ornatus Latham, Rainbow Bird (Bee-Eater).

Eight miles west of Narrandera, 19 October, 1932 (a.m.), ♂ (0·33163).—*Hymenoptera:* 19 heads and other remains of Hive Bees (*Apis mellifica*).

Owenavis osculans Gould, Black-eared Cuckoo.

Near Agricultural High School, Yanco, 30 September, 1932 (p.m.), ♂ (0·33136).—*Lepidoptera :* A large quantity of the remains of larvæ of Cup Moths (*Doratifera vulnerans*).

Rhipidura flabellifera Gmelin, Grey Fantail.

Macpherson Range, Leeton, 5 October, 1932, ♀ (0·33145).—*Miscellaneous Insects :* Finely divided and undentifiable insect remains.

Petroica goodenovii Vigors and Horsfield, Red-capped Robin.

Murdering Sand Hills, Narrandera, 14 October, 1932 (a.m.), ♂ (0·33141).—*Hymenoptera :* 26 ants (*Pheidole* sp.).

Eopsaltria australis Shaw, Southern Yellow Robin.

Murrumbidgee River, Yanco, 27 September, 1932 (p.m.), ♂ (0·33162).—*Lepidoptera :* Clusters of spines from Cup Moth larvæ (*Doratifera vulnerans*). *Coleoptera :* Unidentifiable beetle fragments. *Hymenoptera :* Head of a bee (? *Halictus* sp.). *Miscellaneous Insects :* Unidentifiable insect remains.

Pachycephala rufiventris Latham, Rufous Whistler.

(*a*) Near Agricultural High School, Yanco, 30 September, 1932 (p.m.), ♂ (0·33137).—*Coleoptera :* Unidentifiable fragments. *Lepidoptera :* Larvæ of Cup Moths (*Doratifera vulnerans*). *Hemiptera :* Wings of Psyllids. *Aranaeidæ :* Numbers of small spiders (immature).

(*b*) Near Agricultural High School, Yanco, 30 September, 1932 (p.m.), ♂ (juvenile) (0·33138). *Coleoptera :* Beetle fragments (? *Paropsis* sp.).

Colluricincla harmonica Latham, Grey Shrike-Thrush.

(*a*) Murrumbidgee River, Yanco, 12 October, 1932 (p.m.), ♂ (0·33174).—*Coleoptera :* 2 *Paropsis* spp., and other beetle fragments. *Lepidoptera :* 2 larvæ of Cup Moth (*Doratifera vulnerans*). *Orthoptera :* 1 Cockroach egg-case.

(*b*) Agricultural High School, Yanco, 28 September, 1932 (p.m.). ♂.—*Coleoptera :* *Paropsis* spp., both adult beetles and larvæ, and many fragments of Chrysomelidæ and Curculionidæ. *Lepidoptera :* Larvæ of Cup Moth (*Doratifera vulnerans*), and the cocoon of a small moth. *Hymenoptera :* Ants. *Chilopoda :* The leg of a Centipede. *Miscellaneous Insects :* Comminuted fragments of insects.

Coracina novae-hollandiae Gmelin, Black-faced Cuckoo-Shrike.

(*a*) Yanco Agricultural High School, Yanco, 28 September, 1932. (p.m.) ♂ (0·33164).—*Coleoptera :* *Paropsis* spp. *Lepidoptera :* Moth larvæ. *Miscellaneous :* A large piece of mussel shell (accidental).

(*b*) Murrumbidgee River, Yanco, 12 October, 1932 (p.m.), ♀ (0·33165).—*Coleoptera :* 2 *Paropsis* sp., and the larva of a beetle ?, together with other beetle remains. *Lepidoptera :* 1 larva of Cup Moth (*Doratifera vulnerans*).

Lalage tricolor Swainson, White-winged Triller (Caterpillar Eater).

Macpherson Range, Leeton, 5 October, 1932 (a.m.), ♂ (0·33161).—*Coleoptera :* Small Chrysomelidæ. *Lepidoptera :* Scales from Lepidoptera. *Miscellaneous Insects :* Very finely comminuted insect fragments.

Pomatostomus temporalis Vigors and Horsfield, Grey-crowned Babbler.

(*a*) Agricultural High School, Yanco, 28 September, 1932 (p.m.), ♂ (0·33180).—*Coleoptera :* Small fragments. *Lepidoptera :* 12 Lepidopterous larvæ. *Miscellaneous Insects :* Unidentifiable insect remains.

(*b*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♀ (0·33182).—*Coleoptera :* Tenebrionidæ, Elateridæ, Carabidæ (*Sarothrocrepis* sp. and *Ectroma* sp.), Scarabæidæ (*Onthophagus* sp.), and a quantity of finely divided beetle remains.

(*c*) Eight miles west of Narranders, 10 October, 1932 (p.m.), ♂ (0·33183).—*Coleoptera :* Curculionidæ and Carabidæ. *Araneidæ :* Spiders.

NOTE.—All stomach contents in fragmentary condition.

(*d*) Eight miles west of Narrandera, 19 October, 1932 (a.m.), ♀ (0·33184).—*Coleoptera :* Fragments only. *Lepidoptera :* 4 Lepidopterous larvæ. *Araneidæ :* 1 spider. *Miscellaneous Insects :* Finely broken fragments.

Aphelocephala leucopsis Gould, Eastern Whiteface.

(*a*) Macpherson Range, near Leeton, 5 October, 1932 (p.m.), ♀ (0·33143).—*Coleoptera :* One beetle elytron. *Seeds :* *Erodium* sp. (Graminaceæ).

(*b*) Macpherson Range, near Leeton, 5 October, 1932 (p.m.), ♂ (0·33144).—*Seeds :* *Erodium* sp. (Graminaceæ).

Cincloramphus mathewsi Iredale, Rufous Song Lark.

(*a*) Agricultural High School, Yanco, 28 September, 1932 (p.m.), ♂ (0·33158).—*Coleoptera :* 2 weevils (Curculionidæ), and fragments of unidentifiable beetles. *Lepidoptera :* Scales and hairs from moths. *Hymenoptera :* Ants.

(*b*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33159).—*Coleoptera :* Curculionidæ, Tenebrionidæ, and Elateridæ. *Lepidoptera :* Moth Larvæ. *Hemiptera :* Membracidæ and Jassidæ. *Orthoptera :* Forficulidæ. *Araneidæ :* Spiders. *Miscellaneous :* A quantity of unidentifiable fibrous matter (? origin).

(*c*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♀ (0·33160).—*Coleoptera :* Unidentifiable fragments. *Lepidoptera :* Scales and hairs of moths.

Artamus leucorhynchus Linnæus, White-breasted Wood-Swallow.

(*a*) Five Bough Swamp, Leeton, 3 October, 1932 (p.m.), ♂ (0·33150).—*Coleoptera :* 9 small Carab beetles (*Ectroma* sp.). *Hymenoptera :* 6 Hive Bees (*Apis mellifica*), 1 drone and 5 workers. 1 winged ant and 1 Ruby Wasp (*Stilbum* sp.).

(*b*) Five Bough Swamp, Leeton, 3 October, 1932 (p.m.), ♂ (0·33151).—*Hymenoptera:* 1 Ruby Wasp (*Stilbum* sp.). *Odonata:* 1 entire dragon-fly (*Aeschna brevistyla*). *Diptera:* 1 Muscoid fly. *Orthoptera:* Remains of immature Grasshoppers (*Calataria terminifera*). *Miscellaneous Insects:* Unidentifiable insect fragments. *Araneidae:* 1 spider.

Artamus cyanopterus Gould, Dusky Wood-Swallow.

Murrumbidgee River, Yanco, 12 October, 1932 (p.m.), ♂ (0·33149).—*Coleoptera:* Fragments. *Diptera:* Unidentifiable fragments of flies.

Climacteris picumnus Temminck, Brown Tree-Creeper.

(*a*) Yanco Agricultural High School, Yanco, 28 September, 1932 (p.m.), ♂ (0·33152). *Coleoptera:* Fragments of small beetles. *Hymenoptera:* Heads of ants.

(*b*) Macpherson Range, Leeton, 5 October, 1932, ♂ (0·33153).—*Miscellaneous Insects:* Unidentifiable insect remains and a quantity of stout hairs (? from Lepidopterous larvæ).

Pardalotus striatus Gmelin, Striated Pardalote.

(*a*) Murrumbidgee River, Yanco, 12 October, 1932 (p.m.), ♂ (0·33139).—*Hemiptera:* Main stomach contents: Lerp-scales of Psyllids. *Miscellaneous Insects:* Unidentifiable insect remains.

(*b*) Murrumbidgee River, Yanco, 12 October, 1932 (p.m.), ♂ (0·33140).—*Hemiptera:* Lerp-scales of Psyllids. *Miscellaneous Insects:* Unidentifiable insect fragments.

Melithreptus brevirostris Vigors and Horsfield, Brown-headed Honey-Eater.

Macpherson Range, Leeton, 5 October, 1932, ♂ (0·33142).—*Miscellaneous Insects:* Indeterminable insect remains.

Meliphaga penicillata Gould, White-plumed Honey-Eater.

(*a*) Murrumbidgee River, Yanco, 27 September, 1932 (p.m.), ♀ (0·33146).—*Hemiptera:* Lerp-scales of Psyllidæ. *Miscellaneous Insects:* Unidentifiable insect remains. *Miscellaneous:* Several masses of fruiting threads of a fungus (? mould).

(*b*) Murrumbidgee River, Yanco, 27 September, 1932 (p.m.), ♂ (0·33147)· *Coleoptera:* Minute fragments of beetles, mainly Curculionidæ· *Hemiptera:* 1 lerp-scale of Psyllid.

(*c*) Near Yanco Agricultural High School, Yanco, 30 September, 1932 (p.m.), ♂ (0·33148).—*Hymenoptera:* 1 larva of Saw-fly (*Perga dorsalis*), entire. *Hemiptera:* Head of large Pentatomid bug. *Lepidoptera:* Quantity of hairs and scales of moths. *Miscellaneous Insects:* Fragments.

Myzantha melanocephala Latham, Noisy Miner (Soldier-Bird).

(*a*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33176).—*Coleoptera:* Beetle remains, finely broken and mainly unrecognizable, but Clerids and Paropsis sp. in evidence.

(*b*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♀ (0·33178).—*Coleoptera:* Scarabæidæ and Chrysomelidæ. *Lepidoptera:* Remains of larvæ.

(*c*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33179).—*Coleoptera:* Chrysomelidæ and Curculionidæ, otherwise too fragmentary for identification. *Lepidoptera:* Wings, scales, and hairs of moths, also the remains of a larva. *Diptera:* Muscidæ.

Entomyzon cyanotus Latham, Blue-faced Honey-Eater.

Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♀ (0·33175).—*Hemiptera:* A large quantity of lerp-scales of Psyllidæ. *Lepidoptera:* A quantity of scales and hairs from Lepidoptera, and remains of a ? Lepidopterous larva. *Miscellaneous Insects:* Too fragmentary for identification.

Philemon corniculatus Latham, Noisy Friar-bird.

(*a*) Murrumbidgee River, Yanco, 27 September, 1932 (p.m.), ♀ (0·33186).—*Hymenoptera:* Heads of 2 bees (? genus). *Hemiptera:* Lerp-scales of Psyllidæ. *Diptera:* Crane flies (*Gynoplistia ? bella*). *Miscellaneous Insects:* Unidentifiable insect remains. *Miscellaneous:* Stamens of flowers (?)

(*b*) Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♀ (0·33187).—*Coleoptera:* Unidentifiable remains. *Diptera:* 6 Crane Flies (*Gynoplistia ? bella*) intact. One unidentifiable fly, and fragmentary Dipterous remains. *Hymenoptera:* 1 native bee (? *Halictus* sp.). 4 heads of bees. Remains of 2 Hymenopterous insects (otherwise unidentifiable). Six ants, and finely broken fragments of Hymenoptera.

Philemon citreogularis Gould, Little Friar-bird.

Murrumbidgee River, Yanco, 27 September, 1932 (p.m.), (? sex) (0·33185).—*Coleoptera:* Fragments of beetles. *Hemiptera:* Lerpscales of Psyllidæ. *Hymenoptera:* Heads of 2 bees (? genus). *Miscellaneous Insects:* Finely comminuted fragments of insects. *Miscellaneous:* Stamens of flowers (?).

Taeniopygia castanotis Gould, Zebra Finch.

(*a*) Five Bough Swamp, Leeton, 6 October, 1932, ♂.—*Seeds:* *Erodium* sp. (Graminaceæ). *Miscellaneous:* Fine sand.

(*b*) Five Bough Swamp, Leeton, 6 October, 1932, ♀.—*Seeds:* *Erodium* sp. (Graminaceæ). *Miscellaneous:* A little fine sand.

Struthidea cinerea Gould, Apostle Bird.

Eight miles west of Narrandera, 10 October, 1932 (p.m.), ♂ (0·33189).—*Seeds:* *Erodium* sp. (Graminaceæ) *Vegetable matter:* A large quantity of finely divided vegetable matter (some still green), unrecognisable.

Corcorax melanoramphus Vieillot, White-winged Chough.

(*a*) Macpherson Range, near Leeton, 5 October, 1932 (a.m.), ♂ (0·33172).—*Coleoptera:* 1 Elateridæ, 1 Curculionidæ (*Cubicorrhynchus* sp.), and a quantity of unidentifiable beetle remains. *Hymenoptera:* 14 larvæ of *Perga dorsalis*. *Hemiptera:* Remains of Pentatomidæ. *Miscellaneous Insects:* A large quantity of unidentifiable insect remains. *Seeds:* A large quantity of the seeds of *Sisyrinchium* sp. (Iridaceæ).

(*b*) Macpherson Range, near Leeton, 5 October, 1932 (a.m.), ♀ (0·33173).—*Coleoptera:* Finely divided beetle remains. *Miscellaneous Insects:* Unidentifiable insect fragments. *Miscellaneous:* Gravel.

Sturnus vulgaris Linnæus, Starling.

(*a*) Farm No. 27, Yanco, 12 January, 1927, ♂.—*Coleoptera:* Head of a large beetle. *Lepidoptera:* Mandibles of caterpillar. *Miscellaneous Insects:* ? Mandible of insect. *Vegetable matter: Fruit:* A large piece of yellow fruit skin (? plum), ¾ inch square, and one piece ¼ inch square. A large piece of purple prune skin, 1½ inches x ½ inch, and two smaller fragments, all with pulp adhering. *Miscellaneous Vegetable matter:* Scales from fruit buds. *Crop. Fruit:* The crop completely filled with small pieces of fruit skin, pulp, and fibre.
NOTE.—Shot in orchard among prune trees.

(*b*) Farm No. 1178, Yanco, 1 February, 1927, (? sex).—*Seeds:* 31 seeds of Creeping Saltbush (*Atriplex semibaccatum*).
NOTE.—Shot in vineyard among sultana vines.

(*c*) Farm No. 1178, Yanco, 1 February, 1927, (? sex).—*Coleoptera:* Abdomen and elytra of a small weevil (Curculionidæ). *Vegetable matter:—Seeds:* 23 seeds of Creeping Saltbush (*Atriplex semibaccatum*). *Fruit:* A quantity of unidentifiable fruit pulp and skin). *Miscellaneous Vegetable matter:* Spore case of Nardoo (*Marsilea* sp.).
NOTE.—Shot in vineyard among sultana vines.

(*d*) Farm No. 1178, Yanco, 1 February, 1927, (? sex).—*Vegetable matter: Seeds:* 53 seeds of Creeping Saltbush (*Atriplex semibaccatum*). *Fruit, etc.:* 7 more or less complete sultana skins, and 13 stems of sultana berries.
NOTE.—Shot in vineyard among sultana vines.

(*e*) Farm No. 27, Yanco, 1 April, 1927, (? sex).—*Coleoptera:* 1 Carab beetle. *Orthoptera:* Foreleg of a small Mole Cricket (*Gryllotalpa* sp.). *Miscellaneous Insects:* A quantity of finely divided insect remains. *Vegetable matter:—Fruit:* 3 sultana skins, 10 grape stems and a grape seed. A quantity of grape pulp.
NOTE.—Shot while feeding on irrigated land near sultana vines.

(*f*) Farm No. 27, Yanco, 1 April, 1927, (? sex).—*Vegetable matter: Fruit:* 7 entire dried sultanas, and 6 grape stems. *Cultivated grain:* 18 wheat grains. *Seeds:* 12 seeds of Creeping Saltbush (*Atriplex semibaccatum*). *Miscellaneous Vegetable matter:* A considerable quantity of unidentifiable vegetable matter (? bran from wheat). *Miscellaneous:* Quantity of quartz gravel.
NOTE.—Shot while feeding on irrigated land near sultana vines.

(*g*) Farm No. 27, Yanco, 1 April, 1927, (? sex).—*Coleoptera:* Finely divided remains of small black beetles (unidentifiable). *Vegetable matter: Fruit:* 9 more or less intact sultana berries. *Seeds:* 72 seeds of Creeping Saltbush (*Atriplex semibaccatum*). *Miscellaneous Vegetable matter:* A quantity of unidentifiable matter (? fruit pulp). NOTE.—Shot while feeding on irrigated land near sultana vines.

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1909. Mathews, G. M. On the Birds of North-West Australia. With Field Notes by the Collector, J. P. Rogers. Part II. Birds from Wyndham. *Emu*, ix, 1 October, 1909, pages 53–65.

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THE EGGS AND EARLY LARVAL STAGES OF THE AUSTRALIAN PILCHARD—*SARDINIA NEOPILCHARDUS* (STEIND.).

By

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(Plate xvi, and Figures 1–4.)

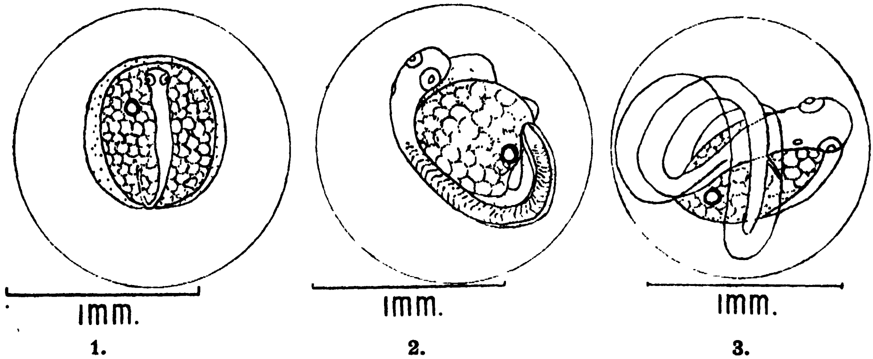
ONE of the most important of the scientific fishery problems to be undertaken in Australian waters is the recognition of the pelagic fish eggs and larvæ (more especially those of commercially important fish) and their seasonal and geographical distribution. It has taken many years to achieve a working knowledge of the fish eggs and larvæ of the North Sea, yet that is a well-defined and almost closed area, which is inhabited by large numbers of a reasonably small list of fish species. In comparison the work to be carried out in the coastal waters of New South Wales alone may prove much more difficult. With a fish hatchery in working order it would be possible to make certain of the characters of the eggs and early larvæ of at least some of our important fish species. Unfortunately, so far as this is concerned, fish hatcheries for marine fish species are not particularly favoured by experts to-day, but marine laboratories would make it worth while to attempt the hatching and rearing on a small scale. Eggs can also be pressed from ripe fish on board a trawler and sperm obtained in the same way. That fertilization can be achieved with the simplest apparatus in this manner in Australian waters has already been proved by the authors.

Another method of determining the species of fish eggs and one of wide application, although necessitating time and patience, is that of collecting both eggs and larvæ by the utilization of coarse meshed plankton nets at sea. These eggs and larvæ are sorted out and the different stages fitted together until examples are obtained possessing characters sufficiently marked to indicate the identity of the mother fish. The present paper is concerned with the discovery of the eggs of the pilchard by this means.

Plankton nets suitable for the capture of fish eggs have been used regularly during the past two years at a spot about four-six miles east of Sydney Heads. Many different kinds of eggs have been captured during this period. Amongst these the type of egg figured (Figures 1–3) was found to be particularly abundant in three successive years during the months of June, July and August. The egg averages 1·4 millimetres in diameter and is marked by a segmented yolk and a wide perivitelline space. The general appearance of the egg at once suggested that it was one belonging to some species of the herring group (family Clupeidæ). But although we were struck at the outset by a resemblance to the egg of the European pilchard, we hesitated to accept it as a pilchard egg in view of the presence of several clupeid species, to which it might have belonged, in our waters.

Delsman at Batavia[1] found no less than six different kinds of eggs of Clupeids all of the same type as the Sardine or Pilchard egg of Europe—that is, possessing a segmented yolk and a wide vitelline membrane. It was obvious that with several unknown clupeoid possibilities in these waters it would be rash to claim the mere general resemblance to the European pilchard egg as sufficient evidence of identity.[2]

During the year 1933 the eggs first turned up in our catches late in the month of May, and as they were present in considerable numbers a special effort was made by weekly expeditions to obtain later and later larval stages. We were very successful in this, and for five or six weeks the larvæ were collected, larger ones being present in the later hauls until, at the beginning of August, they



Figures 1–3.

Egg of *Sardinia neopilchardus*, Steindachner, diameter 1·4 mm.

Figure 1.—Early stage of development. Figure 2.—Later stage of development. Figure 3.—Ready for hatching.

disappeared. The largest specimen obtained measured 28 mm. in length. This specimen set aside our doubts about the species, for whilst counts of the myotomes had shown an equally possible diagnosis as pilchard, sandy sprat, or blue sprat, the character of the dorsal fin settled the question. The eggs and larvæ were accounted definitely to be those of the Australian pilchard (*Sardinia neopilchardus* Steind.).

The Egg.

The eggs are slightly smaller than those of the European pilchard—*Clupea pilchardus*,[3] and the Japanese sardine—*Clupea melanosticta* Schlegel. The diameter of the eggs of the former is 1·5 to 1·8 mm. and of the latter 1·5 mm. The mode for the eggs of the Australian pilchard in New South Wales waters is 1·44 mm., but they range from 1·27 to 1·5 mm. in diameter. The diameter of the yolk is only ·75 to ·8 mm. There is a distinct bluish tinge to the vitelline membrane which in some cases approaches a red tint. The effect is, however, purely optical

[1] Delsman.—" Fish Eggs and Larvæ from the Java Sea," No. 7, p. 218. Treubia, viii, 3–4, July, 1926.

[2] Regan obtained three specimens of Clupeid larvæ taken by the British Antarctic (Terra Nova) Expedition, 1910, off the coast of New Zealand. These were designated larvæ of the pilchard on the basis of their resemblance to the larval stages of the European species.
See Regan—" Larval and Post-Larval Fishes." British Antarctic (Terra Nova) Expedition, 1910. Natural History Report, Zoology, i, 4, 1916, p. 136.

[3] Ehrenbaum—" Eier und Larven von Fischen " in Brandt und Apstein, Nordisches Plankton, i, 2, 1909.

and not due to the presence of pigment. It disappears when the membrane is dissected away from the egg. A single small oil globule is present as in the European and Japanese pilchard eggs.

The segmentation of the yolk is that characteristic of clupeids and is probably due to the intermixture of cytoplasm and yolk. There seems to be some indication that the separate spherules become larger as the egg develops. Usually all stages of development are found in one catch of eggs and, although no indication of the exact duration of development has been obtained, it may be suggested as not more than two days in the New South Wales coastal waters at 17°C. since the European pilchard egg hatches in four-five days at 9°–12° and the Indian clupeid egg takes less than 24 hours. Already before hatching one other clupeid character can be noted—the anus of the tiny embryo is far posterior in position (see Figure 4).

No pigment is present in the eyes or elsewhere at hatching time.

The newly hatched larva is 2·5 mm. in length. Large numbers of individuals were captured at this stage each year—it was the later stages that were more difficult to obtain.

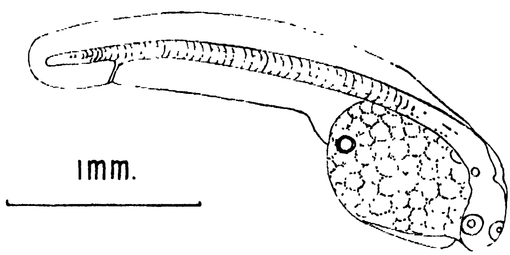


Figure 4.

Newly hatched larva of *Sardinia neopilchardus*, Steindachner, 2·5 mm. Note yolk sac and oil globule, also anal aperture near posterior end.

The remains of the yolk are to be seen appended to the larva (Figure 4); the oil globule is still present and posterior in position. As yet no pigment is present anywhere. A characteristic criss-crossing of the muscle fibres of the myotomes may be noted at this stage; it is figured for the much larger larva of 15·5 mm. (Pl. xvi, fig. 3). At the 2·5 mm. stage the anus lies under about the 42nd myotome.

The yolk sac is still visible when the length of 4·5 mm. is attained (probably 2½–3 days after hatching) but the yolk has now disappeared. The most difficult or crucial period for the young larva has arrived and further development will depend not only on its luck in surviving enemies but on the presence of a suitable supply of microplanktonic plants and animals on which to feed.[4]

The rudiments of the fins may be noted at the stage just mentioned—the first to appear being the pectorals. The intestine also begins to show a characteristic folding (very distinctive of the larvæ of Clupeid fishes) at the length of 4·5 mm.

The embryonic condition of the tail is still a feature of the embryo, but signs of the ventral lobe of the caudal fin are to be seen at the 4·5 mm. stage. The dorsal

[4] One larva of the length of 11·5 mm. (Pl. xvi, fig. 2) contained a newly captured copepod in its stomach. This turned out to be *Paracalanus parvus*, one of the most common species in New South Wales coastal waters.

fin is first visible in our larvæ when the length of 7·5 mm. is reached (Pl. xvi, fig. 1). It is probably present before this, but we had no stage corresponding to a 6 mm. length. The anal fin appears when a length of 12·7 mm. is attained. The pelvic fins do not appear until later when the length of 18 mm. is reached.

Pigment has made its appearance when the larva is about 8 mm. in length. It develops first in the eyes, although at this stage a few chromatophores may also be seen along the ventral margin of the larva.

At a length of 8 mm. the tail shows a distinctly heterocercal character, but the hypural region is developing, and in the subsequent stages the ventral lobe becomes longer and the dorsal reduced, although at 15·5 mm. the dorsal lobe is still present (Pl. xvi, fig. 3).

At an early stage, say 3 mm., it is possible to count 40–42 myotomes in front of the anus, and whilst the number behind is not so distinct it is at least 10. Actual counts of the vertebræ in adult specimens of the Sandy Sprat (*Hyperlophus vittatus* Castelnau), Blue Sprat (*Stolephorus robustus* Ogilby) and Pilchard (*Sardinia neopilchardus* Steind.) give 46 for the first named and 45 for the last two. There is little diagnostic information, therefore, to be gained from those counts in the larva, except to exclude some other possible species. (The number of the vertebræ in the Australian Herring, *Harengula castelnaui* (Ogilby) is 39.)

The 15·5 mm. larva (Pl. xvi, fig. 3) presents well developed hypurals and the caudal fin is approaching the homocercal type, although a distinct separate dorsal portion is to be noted as already mentioned. The dorsal fin is now considerably developed and shows upwards of 16 fin rays—an important point as will be noted below. The anal fin is also well developed, but there is still no trace of the pelvic fins. There is now a series of chromatophores along the body next to the ventral edge, extending from the operculum to the point where the folding of the intestine is to be noted. From this point deeper lying chromatophores can be seen, presumably in the wall of the abominal cavity.

The latest stage captured is that of 28 mm. (Pl. xvi, fig. 4). At this stage the pelvic fins are easily seen, and there are eighteen or nineteen fin rays in the dorsal fin. This in itself cuts out the other possible clupeoid species of our shores. It is a noteworthy fact that the dorsal fin is far posterior and well behind the pelvics, although in the adult the position of the dorsal fin is more nearly midway between head and tail. It is evident that during later development the position of the dorsal fin must move forward. Exactly similar conditions are met with in the development of the European pilchard.

At the 28 mm. stage there are about 38 myotomes in front of the anus (the number is less than at the 8 mm. stage). The tail fin has lost the dorsal lobe and is already homocercal in type with incut middle part giving a bifid appearance. The chromatophores are, as before, a series at the base of the body especially between the head and pelvic fins and between the anus and caudal fin, and in addition there are the abdominal pigment spots associated with the alimentary canal region.

The number of eggs and larvæ captured has at times been considerable. Thus, in a net of cheese cloth with a circular mouth 3 feet in diameter and towed for only 10 minutes near the surface, 406 eggs of *Sardinia neopilchardus* were obtained on 18 July, 1931, and over a thousand in a similar haul on 21 June of that year.

It is fair to assume from the facts now set forth that very considerable numbers of Australian pilchards must be present off the coast of New South Wales during

the months of May or June to August, and indeed this fits in with the statements of fishery inspectors and of men on board trawlers, who have seen them from the deck. It has now been definitely established that the fish are breeding during these months. The characters of the eggs and larvæ have been set out and figured.

These facts should be of the utmost importance in view of the demand for some scientific data regarding the occurrence and migration of our pelagic fish and the possibilities of their exploitation.

EXPLANATION OF PLATE XVI.

Sardinia neopilchardus, Steindachner.

Figure 1.—Larva 7·5 mm. in length. Dorsal fin just beginning to appear.

Figure 2.—Larva 11·5 mm. in length. Note copepod in alimentary canal.

Figure 3.—Larva 15·5 mm. in length.

Figure 4.—Larva 28 mm. in length. Dorsal fin with 19 rays. Pelvic fins well developed.

NOTES ON THE FOOD OF TROUT AND MACQUARIE PERCH IN AUSTRALIA.

By

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(Plate xvii.)

Introduction.

ALTHOUGH of considerable economic value to those engaged in establishing trout in our rivers, and of the greatest interest to anglers, no information appears to have been published regarding the food of trout in Australia. It has been with the intention, therefore, of securing data on this subject that fish stomachs have been procured from time to time, as opportunity permitted, and their contents examined and listed.

Sufficient information has now been secured to warrant the publication of a preliminary paper, and it is hoped that additional material will come to hand to enable further work to be carried out. A very much larger series of stomachs is required, from as many localities as possible and secured over an extended period, before any definite conclusions can be drawn from the results.

Realizing the diversity of tastes of the trout, and that they will feed upon practically any small animals which may come within their reach, and that the presence or absence of any organism is dependent upon climatic and other conditions, I have refrained, as far as possible, from expressing opinions, other than tentatively, simply setting out the results obtained in the hope that future work will enable a fairly exact estimate to be arrived at as to the constitution of trout-foods in Australia.

Although no work has been carried out in Australia to date, much valuable research has been achieved in New Zealand, notably by G. V. Hudson, J. S. Phillips, E. Percival, W. J. Phillipps, and A. W. Parrott.

The question of the decline of trout-fishing, and the depletion of aquatic life in trout-streams has not, as yet, arisen in Australia, but this aspect of the question has given a great impetus to research in fish-foods in New Zealand.

Considerable interest attaches to the composition of trout-food from a purely biological point of view, since the trout is an exotic species introduced into a strange environment, with consequent reaction upon the native fauna and disturbance of the balance of nature which has been so marked in the case of certain terrestrial animals imported into Australia. We have, as yet, no knowledge of a definite nature of the effect upon the aquatic fauna of those streams in which trout have been liberated.

An examination of the contents of trout stomachs from several localities in New South Wales indicates that by far the greater proportion of the insects are terrestrial species which have fallen or been blown into the water from the surrounding vegetation and have been snapped up as they struggled on the surface. On examining the list of genera eaten it would appear that nothing really comes amiss as food. Size of the prey seems to play but a small part in the choice of insects taken by the trout, since small insects, as the Rutherglen Bug (*Nysius vinitor*), are taken with quite as much readiness as large ones.

The New Zealand data show that by far the most important trout-food in the Dominion is provided by the aquatic Neuropteroid insects, but, with the exception of the caddis-flies (Trichoptera), these insects form but a very small proportion of the food of the Australian fish, the most important component in which is undoubtedly the terrestrial insects, chiefly Hymenoptera, Orthoptera, and Coleoptera. This is strongly brought out by the following table, adapted from Phillips[1], showing the food of trout taken in the Wellington Province, N.Z.

Summary of Trout Stomachs.

——	1927-28.	1928-29.	Mr. G. V. Hudson (1899-1902) for Comparison.
Number of stomachs ...	48	42	60
Trichoptera	6,217	6,847	4,804
Ephemeroptera	661	832	529
Plecoptera	21	27	16
Sialoidea	58	69	18
Diptera	65	111	42
Coleoptera	54	23	590*
Hemiptera	16	11	23
Hymenoptera	4	3	4
Lepidoptera	1	...	...
Orthoptera	...	2	3
Arachnida	1	7	4
Crustacea	4	43	1
Mollusca	740	921	21
Oligochæta	2	15	0

* Due to one special case of 500 *Hydora*.

For comparison the total numbers of insects of the same Orders from the stomachs of Rainbow Trout taken in Australian rivers are summarized hereunder :—

Stomach Contents of Rainbow Trout, N.S.W.

Number of stomachs	38
Trichoptera	170
Ephemeroptera	7
Plecoptera	3
Sialoidea	--
Diptera	23
Coleoptera	130
Hemiptera	81
Hymenoptera	695
Lepidoptera	8
Orthoptera	401
Arachnida	12
Crustacea	42
Mollusca	26
Oligochaeta	4

[1] Phillips, J. S.—A Report on the Food of Trout and other Conditions Affecting their Well-being in the Wellington District. Fisheries Bull. No. 2, N.Z. Marine Dept. Wellington, N.Z., 1929, p. 24.

Altogether the stomach contents of forty-four trout have been examined and the preferences of individual fish for certain orders is summarised as follows:— Of 37 stomachs of Rainbow Trout examined, 24 contained Coleoptera, 16 Hemiptera, 24 Hymenoptera, 7 Neuroptera, 14 Orthoptera, 23 Trichoptera, 6 Lepidoptera, 18 Odonata, 1 Sialoidæ, 5 Ephemeroptera, 11 Diptera, 1 Thysanoptera, 1 Perlaria, 8 Araneidæ, 2 Vermes, 3 Crustacea.

Of 6 stomachs of Brown Trout examined, 5 contained Coleoptera, 5 Hemiptera, 5 Hymenoptera, 4 Orthoptera, 4 Trichoptera, 1 Lepidoptera, 6 Odonata, 4 Diptera, 4 Araneidæ, 1 Vermes, 3 Crustacea.

Of 6 stomachs of Perch examined, 2 contained Coleoptera, 3 Hemiptera, 2 Hymenoptera, 1 Neuroptera, 1 Orthoptera, 4 Trichoptera, 2 Lepidoptera, 2 Ephemeroptera, 2 Vermes.

I have as far as possible presented a summary of the stomach contents in tabular form for ease of reference to meet the needs of those consulting the paper, but I have also given the contents of each stomach in full detail, since they form a basis showing the food of individual fish, which can be added to from time to time as the work proceeds. Before the food of any particular species of fish can be rightly assessed a large number of individuals must be examined in detail, and to enable the results of previous workers to be added to those of later investigators the full data as regards individual fish must be available, since a summary of the food of a species will not necessarily indicate the proclivity of individuals of that species to feed upon a particular food.

The calculation of percentages by number of any insect food of fish appears to be of but little value in assessing its importance, since one large insect, as a grasshopper, is equal in bulk to many individuals of a small insect—for example, Caddis flies.

On account of the importance of the environment as a factor in any consideration of the food of fish, I include field notes of considerable value in this regard, relating to the Tuross River, supplied by Dr. A. J. Spiller Brandon:—

"The Tuross River, in which these fish were caught, rises near Nimmitabel on the eastern side of the Divide, and for many miles is shallow and overgrown with tea tree. Its first fishable portion runs through fairly open country 9 miles S.E. of Countegany. This portion is bordered with tea trees and gums, and the banks are covered with tussocky grass. It was along a 3-mile stretch of this portion that the fish were caught. The altitude was 3,700 feet. The river is slow running and wide stretches of weed grow along the sides, and the bottom is also heavily weeded.

"Just before my arrival there had been a freshet in the river, but the water was quite clear. The weather was warm with westerly winds for the first few days, April 8th to 10th, but from then until the 15th it was bitterly cold with high south-west gales. The 16th and 17th were warm still days.

"*Insects.*—Grasshoppers were very few until the last two days. Before the 10th a few Mayflies were seen floating on the water, and were taken readily by the fish. On the evening of the 8th and 9th fish were rising everywhere, the water being covered with a small black insect.

"As the Rainbow and Brown Trout were caught in the same stretch of water it would be interesting to note whether the stomachs of the Brown Trout contain more surface insects than those of the Rainbow."

In addition to data on the food of both Rainbow and Brown Trout, I have included details of the stomach contents of six Macquarie Perch (*Macquaria australasica*) from the Goodradigbee River, which indicate that its feeding habits are very similar to those of the trout.

I am indebted to Dr. C. Anderson, M.A., Director, Australian Museum, Sydney, Dr. A. J. Spiller Brandon, and Mr. A. C. Ebsworth, of Sydney, for considerable trouble taken by them in collecting the stomachs for examination, and for supplying me with much valuable information. My thanks are also due to my colleagues, Messrs. G. P. Whitley and T. Iredale, for identifying material and for much valuable assistance in the preparation of this paper.

Food of Trout.

Hymenoptera.

Ants formed by far the predominating item of trout food in the stomachs examined, and in the case of the fish from the Tuross and Big Badja Rivers the ants were apparently engaged in their nuptial flights, since the greater percentage were winged males and females, which had fallen or been blown into the water where they had been eaten by the fish. In addition to the winged ants, however, there were many workers and soldiers, which had apparently dropped from the overhanging vegetation. In the case of one large specimen of the Bull-dog ant (*Myrmecia gulosa*) it had been swallowed while living, and its mandibles were deeply buried in the stomach wall of the trout and required considerable force to disengage them. As this ant is possessed of an extremely potent sting, it may have made its presence felt in an unexpected manner. The principal genera represented were the Sugar Ants (*Camponotus*), the Bull-dog Ants (*Myrmecia*), and the Meat Ant (*Iridomyrmex detectus*), together with other species of the genus.

The Thynnid wasps found in the stomach contents were, for the most part' apparently taken *in cop.*, for in most cases the males and females in each stomach were in equal numbers. The female Thynnid wasp is wingless and is carried about by the male while pairing.

Several specimens of a Paper-nest Wasp (*Polistes* sp.) were found. The most prevalent Ichneumon was the common *Paniscus productus*, a large reddish species widely distributed throughout Australia. Bees of several species occurred in small numbers, while other members of the order were negligible.

Orthoptera.

Locusts or Short-horned Grasshoppers (*Acridiidæ*), both mature and immature, form a very large proportion of the stomach contents, and on the evidence available appear to be the most important item of trout food in those seasons when they are available in the larval and nymphal stages. The insects are fairly bulky and would appear to have a high food value, since they are preyed upon by birds almost exclusively when they are available. A total of 267 grasshoppers, all practically intact, together with a quantity of broken remains, was taken from the stomach of one Rainbow Trout captured in the Big Badja River, New South Wales. The strongly muscular walls of the stomach of this fish were distended with food to such an extent that the membrane was almost transparent and little thicker than paper. Other fish had fed largely upon grasshoppers.

Trichoptera.

The next food of importance, disclosed by an examination of the stomach contents, was the Caddis-flies, which proved to be the only aquatic Neuropteroid insects preyed upon in sufficient numbers to be considered of economic importance. This is quite contrary to the New Zealand data, which prove them to be the staple food of trout in the Dominion. The majority of the Caddis cases found were constructed of sand grains (Sericosmatidæ), while those formed by tunnelling in twigs and portions of the stems of aquatic plants (Leptoceridæ) were much less numerous.

Coleoptera.

Beetles form a considerable portion of the food of trout in New South Wales, especially members of the Scarabæidæ. The small species of the genera *Phyllotocus* and *Heteronyx* frequently occur in summer on the flowers of the tea-trees, from which they fall into the water and are eaten by the fish. Dung beetles (*Onthophagus* spp.) occurred in small numbers, apparently meeting with disaster in the water while flying. Dryopidæ and their larvæ, in spite of their small size, appear to be relished by both trout and perch. Carab beetles (Carabidæ), weevils (Curculionidæ), and Chrysomelidæ were present somewhat rarely, and Water beetles (Dytiscidæ and Gyrinidæ) were found only in small numbers and are not nearly as numerous as one would expect.

Hemiptera.

Aquatic bugs were found in the stomachs fairly frequently, especially the Water-striders (Gerridæ), small dark slate-grey insects, which run rapidly over the surface of the water, but in spite of the swiftness of their movement fall a prey to the fish. Water-boatmen (Notonectidæ) and Back-swimmers (Corixiidæ) were present in several instances. The terrestrial plant bug (Pentatomidæ, etc.) and tree-hoppers (Jassidæ), were found but rarely, and their occurrence is probably more or less accidental, they having been picked up from the surface of the water together with other insects.

Diptera.

The order Diptera includes a number of families which contain species with aquatic larvæ, such as the mosquitoes (Culicidæ) and the Chironomid midges (Chironomidæ), both of which are possibly of value as fish food, especially in the case of young fish, although they were present but rarely in the stomachs examined.

A remarkable feature of the trout stomachs from the Tuross River was the number of the curious Stratiomyid fly (*Boreoides subulatus*) present. The females of this fly are wingless, but the males are furnished with well-developed wings; they occur in the higher elevations of New South Wales. Nothing seems to have been recorded with reference to their life history, but from their presence in the fish stomachs it would appear probable that their larvæ are aquatic, as in certain other members of the genus, and that the flies fall a prey to the fish when emerging.

Odonata.

The larvæ and nymphs of both Anisopterid and Zygopterid dragon-flies occur constantly, but in small numbers, in the stomach contents of trout, together with a few of the adult insects, but they do not appear to constitute an important item of their food. Tillyard[2] states that in certain parts of New Zealand he found dragon-fly larvæ to be the principal food of trout.

[2] Tillyard, R. J.—Report on Neuropteroid Insects of the Hot Springs Region, N.Z., in relation to the Problem of Trout Food. Proc. Linn. Soc., N.S.W., XLV, 1920, pp. 205-213.

Crustacea.

Small fresh-water shrimps (*Paratya australiensis*) were found in some of the stomachs examined, and are apparently an excellent food for trout. Of the fresh-water crayfish or "Yabbie" (*Parachæraps bicarinatus*), two examples only were found in the stomach of a 5-lb. Brown Trout from the Tuross River.

Mollusca.

Several stomachs contained a considerable number of snails of the genus *Bullinus*, apparently gathered from acquatic weed or the bottom of the stream.

The Stomach Contents of the Rainbow Trout.

(*Salmo irideus.*)

Stomach contents of Rainbow Trout taken by Dr. C. Anderson, Australian Museum, Sydney. Goodradigbee River, New South Wales, January, 1931.

No. 1.—Coleoptera: 3 Scarabæid beetles, 2 Click beetles (Elateridæ), 7 beetles (Chrysomelidæ). Hemiptera: 3 plant bugs (Pentatomidæ), 2 plant bugs (Coreidæ), 1 tree hopper (*Eurymeloides* sp.), 1 Corixiid. Hymenoptera: 9 ants (*Camponotus* sp.), 3 ants (unindentifiable), 1 bee (? *Hylæus* sp.), 1 Ichneumon wasp (*Paniscus* sp.). Neuroptera: Remains of a Neuropteroid insect. Vegetable matter: A quantity of vegetable matter.

No. 2.—Coleoptera: 6 Scarabæid beetles (*Phyllotocus* sp.), 1 weevil (Curculionidæ). Hemiptera: 1 water strider (*Gerris* sp.). Hymenoptera: 2 bees (? gen.). Diptera: Unindentifiable remains.

No. 3.—Coleoptera: 5 Dryopid beetle larvæ. Hymenoptera: 5 ants (*Camponotus* sp.), 2 ants (unindentifiable), 1 Ichneumon wasp (*Paniscus* sp.). Orthoptera: 1 grasshopper (Acridiidæ, immature) and a quantity of broken remains. Trichoptera: 1 skin of a caddis larva and remains of caddis cases. Araneidæ: 1 spider.

No. 4.—Coleoptera: 1 Scarabæid beetle (*Diphucephala* sp.), 1 weevil (Curculionidæ), 6 beetles (Dryopidæ). Lepidoptera: 3 Lepidopterous larvæ.

No. 5.—Hemiptera: 2 water striders (*Gerris* sp.). Trichoptera: 1 caddis case. Neuroptera: 1 Neuropteroid larva. Miscellaneous: Sand and gravel.

No. 6.—Coleoptera: 12 Scarabæid beetles (*Phyllotocus* sp.). Hemiptera: 3 plant bugs (unidentifiable). Hymenoptera: 1 Ichneumon was, (? gen.). Odonata: 2 Zygopterid dragon-flies. Araneidæ: 1 spider.

No. 7.—Coleoptera: Unidentifiable remains, mostly Scarabæidæ. Hymenoptera: 1 small wasp. Odonata: 1 Zygopterid dragon-fly. Sialidæ: Unidentifiable remains of Alder flies. Vegetable matter: A quantity of vegetable matter.

No. 8.—Coleoptera: 5 Dryopid beetle larvæ. Hemiptera: 3 jassids (immature). Hymenoptera: 3 Ichneumonoid wasps, 1 ant. Trichoptera: 2 caddis flies (mature) and 4 caddis cases. Ephemeroptera: 1 May-fly larva. Odonata: 1 Zygopterid dragon-fly. Miscellaneous Insects: 3 aquatic larvæ (? group). Araneidæ: 1 spider.

No. 9.—Hemiptera: 1 plant bug (immature). Hymenoptera: 3 ants (unidentifiable). Odonata: 1 Anisopterid dragon-fly nymph, 1 Zygopterid dragon-fly nymph. Orthoptera: 1 grasshopper (Acridiidæ). Diptera: 2 Chironomid pupæ. Neuroptera: 9 Neuropterous larvæ.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus*).

Order	Family	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	Total
Coleoptera	Scarabaeidæ	3	6		1		12	*						4	13		5				1				1	21		3			3		1					17	2	93
	Elateridæ	2																															1					1		4
	Chrysomelidæ	7																													1		3							11
	Curculionidæ		1		1											1										3		1			1		1							9
	Dryopidæ			5	6				5				17		3			8	7		26			1		1														79
	Carabidæ													2	2											2														6
	Lampyridæ													2	1																									3
	Tenebrionidæ														1																									1
	Dytiscidæ																									8							1							9
	Buprestidæ																						1			1														2
	Mordellidæ																									1														1
	Gyrinidæ																										1													1
	Cerambycidæ																														1									1
	Unidentifiable							*							*			*																						...
Hemiptera	Pentatomidæ	3					3								4								1			1					1								1	14
	Coreidæ	2																																						2
	Jassidæ	1							3						2											2														8
	Corixidæ	1																										1			1					1			3	7
	Notonectidæ	*																																				1	2	3
	Gerridæ		1			2									2																									5
	Lygaeidæ																								33						1									34
	Cydnidæ																														3									3
	Unidentifiable									1	1																				1									3
Hymenoptera	Formicidæ	12		7					1	3				4	8	1	5		5	4						2		2		2	104	3	96		1		3	32	364	660
	Apidæ	1	2												2		1									1		2					1							10
	Ichneumonidæ	1		1			1		3					2	1											1												1	2	13
	Vespidæ							1									2																							3
	Braconidæ																						1			1														2
	Thynnidæ																									1												5		6
	Chalcididæ																														1									1
Neuroptera	Chrysopidæ																			1																				1
	Unidentifiable	1				1				9											5		6			3														25
Orthoptera	Acrididæ			1						1							1		1							1	2	267		79	27		7		6	4		1	1	399
	Gryllidæ																											2												2
Trichoptera				1		1			6				2		8	73	3	3		4	1		2	9	4	4	2	1		2	3	5		1			30	2	3	170
Lepidoptera	Noctuidæ													1	1																									2
	Unidentifiable				3														1							1											1			6
Odonata	Anisoptera									1	1		1								2							5		1		1	4	1			18		1	36
	Zygoptera						2	1	1	1	1			*	*	1																					1		2	10
Sialidæ								*																																...
Ephemeroptera									1		1			*			*																						5	7
Diptera	Chironomidæ									2																														2
	Syrphidæ														1																									1
	Culicidæ																						1																	1
	Muscidæ																						1			1				1										3
	Tipulidæ																			1																				1
	Mycetophyllidæ																																						12	12
	Unidentifiable		*											*	*	*												*		3										3
Thysanoptera																															1									1
Perlaria														3																										3
Miscellaneous Insects	Fragments													*					*	*		*				*					*						*	*	*	...
	? Group								3		1		12																											16
Araneidæ				1			1		1						1											4								2	1			1		12
Vermes																										1													3	4
	Crustacea																					2					38							2						42
Mollusca																													1							25				26
Miscellaneous	Sand and gravel					*						*						*		*																				...
	Algæ													*			*								*															...
	Bark and twigs																							*	*															...
	Unidentified veg. matter	*						*																					*						*			*		...
	Feathers, etc.																								*															...
																																								1,759

* Indicates present but not countable.

[Insert between pages 146 147.

No. 10.—Hemiptera: 1 small Hemipteron. Odonata: 1 Anisopterid dragon-fly nymph, 1 Zygopterid dragon-fly nymph. Ephemeroptera: 1 May-fly nymph. Miscellaneous insects: 1 aquatic larva ?

No. 11.—Miscellaneous: Sand and gravel only.

No. 12.—Coleoptera: 17 Dryopid beetle larvæ. Trichoptera: 2 caddis cases. Odonata: 1 Anisopterid dragon-fly nymph. Miscellaneous insects: 12 aquatic larvæ ?

Stomach contents of Rainbow Trout taken by Dr. C. Anderson, Australian Museum, Sydney. Goodradigbee River, New South Wales, 6 miles above Wee Jasper, December, 1931.

No. 13.—Coleoptera: 4 Scarabæid beetles (*Phyllotocus navicularis*), 2 Carab beetles (*Clivinia* sp.), 2 soldier beetles (*Telephorus* sp.), 1 Caraboid beetle larva. Hymenoptera: 2 Ichneumon wasps (*Paniscus productus*), 3 ants (*Camponotus nigriceps*), 1 ant (*Iridomyrmex detectus*). Lepidoptera: 1 Bugong moth (*Agrotis infusa*). Perlaria: 3 stone flies and a large quantity of wing remains. Odonata: A large quantity of wings of Zygopterid dragon-flies. Diptera: Wing remains. Ephemeroptera: Wings. Miscellaneous insects: A quantity of unidentifiable insect remains. Vegetable matter: Algæ.

No. 14.—Coleoptera: 1 beetle and 2 larvæ (Dryopidæ), 1 soldier beetle (*Telephorus* sp.), 1 beetle (*Chalcopterus* sp.), 10 Scarabæid beetles (*Phyllotocus navicularis*), 3 Scarabæid beetles (*Heteronyx* sp.), 2 Carab beetles (*Clivinia* sp.), and a quantity of unidentifiable beetle remains. Hemiptera: 2 unidentifiable bugs (Pentatomidæ), 2 plant bugs (*Œchalia schellenbergii*), 1 *Dictyophora* sp., 1 tree hopper (*Eurymela* sp.), 1 jassid, 2 water striders (*Gerris* sp.). Hymenoptera: 2 bees (*Halictus* sp.), 8 ants (unidentifiable), 1 Ichneumon wasp (unidentifiable). Lepidoptera: 1 Noctuid moth. Diptera: 1 Syrphid fly, and a quantity of Dipterous remains. Trichoptera: 8 caddis cases. Odonata: Wings of Zygopterid dragon-flies. Araneidæ: 1 Salticid spider.

No. 15.—Coleoptera: 1 *Rhantus pulverosus*. Hymenoptera: 1 ant (*Camponotus nigricepts*). Trichoptera: 73 caddis cases. Odonata: 1 Zygopterid dragon-fly. Diptera: Quantity of unidentifiable insect remains.

No. 16.—Coleoptera: 5 Scarabæid beetles (*Phyllotocus navicularis*), and unidentifiable beetle remains. Hymenoptera: 2 wasps (*Polistes variabilis*), 4 ants (*Camponotus nigriceps*), 1 ant (*Amblyopone* sp.), 1 bee (*Halictus* sp.). Orthoptera: 1 grasshopper (immature). Trichoptera: 3 caddis cases. Ephemeroptera: Remains of May-flies. Vegetable matter: Algæ.

No. 17.—Coleoptera: 8 Dryopid beetle larvæ. Trichoptera: 3 caddis cases. Miscellaneous: Quantity of sand and gravel.

No. 18.—Coleoptera: 5 beetles and 2 larvæ (Dryopidæ), 1 Caraboid larva. Hymenoptera: 4 ants (*Iridomyrmex detectus*), 1 ant (*Ectatomma metallicum*). Orthoptera: 1 grasshopper (immature). Lepidoptera: 1 moth (unidentifiable). Miscellaneous insects: A small quantity of unidentifiable insect remains.

No. 19.—Hymenoptera: 3 ants (*Camponotus nigriceps*), 1 ant (unidentifiable). Diptera: 1 crane fly (Tipulidæ). Trichoptera: 4 caddis cases. Neuroptera: 1 lacewing (*Chrysopa* sp.). Miscellaneous insects: A small quantity of unidentifiable insect remains. Miscellaneous: Small quantity of sand and gravel.

No. 20.—Coleoptera: 26 Dryopid beetle larvæ, 1 Scarabæid beetle (*Phyllotocus* sp.). Odonata: 1 Anisopterid dragon-fly larva and the mask of another. Trichoptera: 1 caddis case. Neuroptera: 5 Neuropterous larvæ.

No. 21.—Vermes: 2 Gordian worms. Miscellaneous: A small quantity of unrecognizable animal and vegetable matter.

No. 22.—Coleoptera: 1 water beetle. Hemiptera: 1 plant bug. Hymenoptera: 1 Braconid wasp. Trichoptera: 2 caddis cases. Diptera: 1 mosquito (*Megarrhinus* sp.), 1 Dipterous larva (Muscid). Neuroptera: 6 Neuropterous larvæ. Miscellaneous: Hairs from Lepidopterous larvæ ?

No. 23.—Coleoptera: 1 Dryopid beetle larva. Trichoptera: 9 caddis cases. Vegetable matter: A large fragment of bark ¾ in. x ¼ in.

No. 24.—Coleoptera: 1 Scarabæid beetle (*Phyllotocus* sp.). Trichoptera: 4 caddis cases. Vegetable matter: 8 slender twigs measuring up to 4½ inches in length. A quantity of large pieces of bark, and a large quantity of Algæ.

No. 25.—Coleoptera: 16 Scarabæid beetles (*Phyllotocus navicularis*), 3 Scarabæid beetles (*Heteronyx* sp.), 1 beetle (*Cisseis* sp.), 1 beetle (Dryopidæ), 1 weevil (Curculionidæ), 2 dung beetles (*Onthophagus* sp.), 8 water beetles, 2 Carab beetles, 3 beetles (*Tomyrus* sp.), 1 Mordellid beetle. Hemiptera: 33 Rutherglen bugs (*Nysius vinitor*), 2 jassids, 1 plant bug (Pentatomidæ). Hymenoptera: 1 Ichneumon wasp, 2 ants (unidentifiable), 1 bee (*Halictus* sp.), 1 Braconid wasp, 1 Thynnid wasp. Orthoptera: 1 grasshopper (immature). Trichoptera: 4 caddis cases. Lepidoptera: 1 moth (unidentifiable). Neuroptera: 3 Neuropterous larvæ. Diptera: 1 fly (Muscoid). Vermes: 1 Gordian worm. Araneidæ: 4 spiders. Miscellaneous insects: A large quantity of insect remains.

Contents of stomachs of Rainbow Trout taken by Mr. A. C. Ebsworth, Sydney, in the Big Badja River, New South Wales, between 1st and 16th April, 1933. Weight of fish between 1½ and 2½ lb. River in flood and about 18 inches above normal level.

No. 26.—1st to 8th April, 1933.—Coleoptera: 1 Gyrinid beetle. Orthoptera: 2 grasshoppers. Trichoptera: 2 large stick caddis cases and larvæ. Crustacea: 38 shrimps (*Paratya australiensis*).

No. 27.—1st-8th April, 1933.—Coleoptera: 1 elephant beetle (*Orthorrhinus cylindrirostris*), 3 Scarabæid beetles. Hymenoptera: 1 winged ant (? gen.), 1 winged ant (*Myrmecia* sp.), 2 bees (*Apis mellifica*). Hemiptera: 1 *Corixa* sp. Orthoptera: 267 grasshoppers, mature and nymph (Acridiidæ, ? gen. et spp.), together with a large quantity of grasshopper remains in an advanced stage of digestion and 2 crickets (immature). Trichoptera: 1 caddis case. Odonata: 5 Anisopterid dragon-fly larvæ. Diptera: 1 Dipterous larva.

No. 28.—1st-8th April, 1933.—Mollusca: 1 snail (*Bullinus* sp.). Vegetable matter: Stomach completely filled with unidentifiable green vegetable matter.

No. 29.—1st-8th April, 1933.—Hymenoptera: 3 ants (? gen. et sp.). Orthoptera: 79 grasshoppers. Trichoptera: 2 caddis cases. Odonata: 1 Anisopterid dragon-fly nymph. Diptera: 1 blowfly (*Calliphora* sp.), 3 flies (unidentifiable).

No. 30.—1st-8th April, 1933.—Coleoptera: 1 beetle (*Paropsis* sp.), 1 Longicorn beetle, 3 small Scarabæid beetles, 1 weevil (? gen. et sp.). Hymenoptera: 104 ants (*Iridomyrmex*, *Camponotus*, *Myrmecia*, and *Amblyopone*; mostly winged), 1 Chalcid wasp. Hemiptera: 1 *Corixa* sp., 3 plant bugs (*Cydnus* sp.), 1 plant bug (*Dærlac* sp.), 1 bug (unidentifiable), 2 plant bugs (Pentatomidæ). Orthoptera: 27 grasshoppers (Acridiidæ). Trichoptera: 3 caddis cases. Thysanoptera: 1 thrips (*Idolothrips spectrum*). Miscellaneous insects: A large quantity of unidentifiable remains.

No. 31.—1st–8th April, 1933.—Hymenoptera: 3 winged ants (*Myrmecia gulosa*). Trichoptera: 5 caddis cases. Odonata: 1 Anisopterid dragon-fly nymph.

No. 32.—1st–8th April, 1933.—Coleoptera: 1 small Scarabæid beetle, 1 small weevil, 1 Click beetle (Elateridæ), 3 Chrysomelid larvæ, 1 water beetle larva. Hymenoptera: 96 ants, mostly winged (*Iridomyrmex*, *Camponotus*, *Myrmecia*, and *Amblyopone*), 1 head of bee (unidentifiable). Orthoptera: 7 grasshoppers. Odonata: 4 Anisopterid dragon-fly nymphs.

No. 33.—16th April, 1933.—Trichoptera: 1 caddis case and larva. Odonata: 1 Anisopterid dragon-fly larva. Araneidæ: 2 small spiders. Crustacea: 2 shrimps (*Paratya australiensis*).

No. 34.—16th April, 1933.—Hymenoptera: 1 winged ant (? gen.). Orthoptera: 6 grasshoppers (Acridiidæ). Araneidæ: 1 spider (*Epeira* sp.). Vegetable matter: A large quantity of vegetable matter.

No. 35.—12th April, 1933.—Hemiptera: 1 *Corixa* sp. Odonata: 4 Anisopterid dragon-fly larvæ and nymphs. Mollusca: 25 snails (*Bullinus newcombi*).

Stomach contents of Rainbow Trout taken by Dr. A. J. Spiller Brandon, Sydney, on the Tuross River, New South Wales, 8 to 16 April, 1933.

No. 36.— ♂., 2½ lb., 11 a.m., 8 April, 1933. Fly: Jungle Cock and Red.—Hymenoptera: 3 ants (*Iridomyrmex detectus*). Trichoptera: 29 caddis cases (27 sand and 2 stick), and one mature caddis fly. Odonata: 18 Anisopterid dragon-fly larvæ and nymphs, and 1 Zygopterid nymph. Lepidoptera: 1 Lepidopterous larva. Miscellaneous insects: A very large quantity of unidentifiable insect remains.

No. 37.— ♀, 3 lb., 11·30 a.m., 9 April, 1933.—Coleoptera: 14 Scarabæid beetles (*Phyllotocus* sp.), 3 Scarabæid beetles (*Heteronyx* sp.), 1 Click beetle (Elateridæ). Hemiptera: 1 *Notonecta* sp. Hymenoptera: 32 ants, winged and workers, including *Myrmecia* sp.), 1 Ichneumon wasp, 5 Thynnid wasps (3 ♂ and 2 ♀), together with a quantity of ant remains. Orthoptera: 1 grasshopper. Trichoptera: 1 caddis case and 1 larva. Odonata: 1 Anisopterid dragon-fly nymph. Miscellaneous insects: A quantity of unidentifiable insect remains. Araneidæ: 1 spider. Vegetable matter: Quantity of vegetable matter.

No. 38.— ♀, 1½ lb., 8·30 a.m., 10 April, 1933. Fly: Alder.—Coleoptera: 2 Scarabæid beetles. Hemiptera: 1 Pentatomid bug, 2 Notonectidæ (immature), 1 *Corixa* sp. Hymenoptera: 364 winged ants (several spp.), and remains of ants, 2 Ichneumon wasps. Orthoptera: 1 mature grasshopper (*Calataria terminifera*). Trichoptera: 3 caddis cases. Odonata: 2 Zygopterid dragonflies. Ephemeroptera: 5 May-flies. Diptera: 12 Mycetophyllid midges. Miscellaneous insects: An exceptionally large quantity of unidentifiable insect remains. Vermes: 3 Gordian worms.

Stomach Contents of Brown Trout (*Salmo fario*).

		1	2	3	4	5	6
Coleoptera	Gyrinidæ	...	1	1	...	...	..
	Scarabaeidæ	...	...	2	3	2	...
	Curculionidæ	...	...	...	1	1	...
	Unidentifiable	...	...	...	...	...	1
Diptera	Stratiomyiidæ	1	...	2	6	6	...
	Tipulidæ	...	...	...	...	1	...
	Unidentifiable	...	...	...	2	...	...
Hemiptera	Notonectidæ	2	...	...	...	...	...
	Gerridæ	...	8	18	...	3	...
	Corixidæ	3	...	...	...	1	...
	Psyllidæ	...	2	...	...	...	...
	Jassidæ	...	...	...	1	...	...
Hymenoptera	Thynnidæ	2	...	2	1	...	...
	Formicidæ	...	40	48	6	3	...
	Ichneumonidæ	...	...	1	...	...	...
	Chalcidiæ	...	...	...	...	1	...
	Vespidæ	...	...	...	...	1	...
	Apidæ	...	...	...	..	2	...
Trichoptera		1	10	7	4	...	...
Odonata	Anisoptera	...	3	...	...	2	...
	Zygoptera	1	...	...	...	2	2
Orthoptera	Acridiidæ	...	3	1	1	4	...
	Gryllidæ	...	...	1	..	...	...
Lepidoptera		...	...	1	..	...	...
Miscellaneous Insects—	Fragments	...	*	*	*	*	*
Crustacea	*Parachæraps* sp.	2	...	...	...	...	...
	Paratya sp.	...	...	1	2	...	...
Araneidæ		...	3	1	2	1	...
Mollusca		...	...	...	...	...	21
Vermes		...	...	...	...	..	1

* Indicates present but not countable.

Stomach Contents of Brown Trout (*Salmo fario*).

Stomach contents of Brown Trout taken by Dr. A. J. Spiller Brandon on the Tuross River, New South Wales, 8 to 16 April, 1933.

No. 1.— ♂, 5 lb.; midday 8 April, 1933. Fly: Jungle Cock and Red.—Hemiptera: 6 *Notonecta* sp., 3 *Corixa* sp. Hymenoptera: 2 Thynnid wasps (♂ and ♀). Trichoptera: 1 caddis case (stick). Odonata: 1 Zygopterid dragon-fly nymph. Diptera: 1 fly (*Boreoides subulatus*, Fam. Stratiomyidæ. Crustacea: 2 crayfish (*Parachæraps bicarinatus*).

No. 2.— ♂, 1 lb., 9 a.m. 10 April, 1933. Fly: Alder.—Coleoptera: 1 small Gyrinid beetle. Hemiptera: 8 *Gerris* sp., 2 Psyllids. Hymenoptera: 40 ants (winged and workers), mainly small *Iridomyrmex* sp. Trichoptera: 10 caddis cases (sand). Orthoptera: 3 grasshoppers, and a quantity of remains. Odonata: 3 Anisopterid dragon-fly nymphs. Miscellaneous insects: Quantity of unidentifiable insect remains. Araneidæ: 3 spiders.

No. 3.— ♂, 2 lb., 3 p.m., 10 April, 1933. Fly: Pennel Black Hackle.—Coleoptera: 2 Scarabæid beetles, 1 Gyrinid beetle. Hemiptera: 18 *Gerris* sp. Hymenoptera: 44 winged ants (several spp.), 4 ants (*Myrmecia gulosa*). [NOTE.—One specimen had the jaws deeply embedded in the stomach-wall of the fish.] 1 Ichneumon wasp, 2 Thynnid wasps (♂ and ♀). Orthoptera: 1 grasshopper,

1 cricket (immature). Trichoptera : 7 caddis larvæ. Lepidoptera : 1 large Lepidopterous larva. Diptera : 2 flies (*Boreoides subulatus*) ♀ ♀. Miscellaneous insects : A very large quantity of unidentifiable insect remains. Araneidæ : 1 spider. Crustacea : 1 shrimp (*Paratya australiensis*).

No. 4.— ♀, 3 lb., 11 a.m., 15 April, 1933. Fly : Black Hackle.—Coleoptera : 3 Scarabæid beetles, 1 weevil. Hemiptera : 1 jassid. Hymenoptera : 5 winged ants (*Camponotus* sp.), 1 winged ant (*Myrmecia* sp.), 1 Thynnid wasp, (♀). Trichoptera : 2 caddis cases and 2 caddis flies. Orthoptera : 1 grasshopper. Diptera : 6 flies (*Boreoides subulatus*, Fam. Stratiomyidæ), 3 ♂ and 3 ♀. 2 flies (unidentifiable). Miscellaneous insects : A large quantity of unidentifiable insect remains. Araneidæ : 2 spiders. Crustacea : 2 shrimps (*Paratya australiensis*). Miscellaneous : Quantity of ? insect eggs.

No. 5.— ♂, 1½ lb., 3 p.m., 15 April, 1933. Fly : Black Hackle.—Coleoptera : 1 Scarabæid beetle (*Onthophagus* sp.), 1 Scarabæid beetle (*Phyllotocus* sp.), 1 weevil. Hemiptera : 3 *Gerris* sp., 1 *Corixa* sp. Hymenoptera : 2 winged ants (*Myrmecia* sp.), 1 winged ant (unidentifiable), 1 Chalcid wasp, 1 wasp (*Polistes* sp.), 2 bees (unidentifiable remains). Orthoptera : 4 grasshoppers. Diptera : 1 crane fly (Tipulidæ), 6 flies (*Boreoides subulatus*, Fam. Stratiomyidæ), ♀ ♀. Odonata : 2 Anisopterid dragon-fly nymphs, 2 Zygopterid dragon-fly nymphs, and wings of imagines. Miscellaneous insects : A quantity of finely broken insect remains. Araneidæ : 1 spider (*Epeira* sp.).

No. 6.— ♀, 2½ lb., 11·30 a.m., 16 April, 1933. Fly : Black Hackle.—Coleoptera : 1 small beetle (unidentifiable). Odonata : 2 Zygopterid dragon-fly nymphs. Mollusca : 21 snails (*Bullinus* sp.). Vermes : 1 Gordian worm. Animal matter : A quantity of unidentifiable matter (? snails).

Summary of Stomach Contents of Macquarie Perch (*Macquaria australasica*).

		1	2	3	4	5	6
Coleoptera	Dryopidæ	15	...	...	...	...	...
	Unidentifiable	...	*	...	...	...	...
Hymenoptera	Formicidæ	...	1	...	...	4	...
Lepidoptera		...	1	...	...	1	...
Trichoptera		5	...	1	...	1	2
Odonata		...	...	...	1	...	...
Neuroptera		2	...	...	...	...	...
Ephemeroptera		...	1	...	...	1	...
Hemiptera	Pentatomidæ	...	1	...	1	4	...
	Gerridæ	...	1	...	...	30	...
	Jassidæ	...	1	...	...	...	...
Orthoptera	Acridiidæ	...	1	...	...	...	...
Miscellaneous Insects	Fragments	...	...	*	...	...	...
Vermes		4	...	...	...	...	2

* Indicates present but not countable.

Stomach Contents of Macquarie Perch

(*Macquaria australasica*).

Stomach-contents of Macquarie Perch taken by Dr. C. Anderson, Australian Museum, Sydney. Goodradigbee River, New South Wales, January, 1931.

No. 1.—Coleoptera : 15 beetles (Dryopidæ). Trichoptera : 5 caddis cases. Miscellaneous insects : 2 aquatic larvæ ? Vermes : 2 intestinal worms.

No. 2.—Coleoptera: Unidentifiable remains. Hemiptera: 1 tree hopper (*Eurymeloides* sp.), 1 plant bug (Pentatomidæ), 1 water strider (*Gerris* sp.). Hymenoptera: 1 ant (unidentifiable). Orthoptera: 1 grasshopper (*Goniæa australasiæ*). Lepidoptera: 1 larva. Ephemeroptera: 1 May-fly nymph.

No. 3.—Trichoptera: 1 caddis larva. Miscellaneous insects: Unidentifiable fragments.

No. 4.—Weight about ¼ lb. Hemiptera: 1 Pentatomid bug. Odonata: 1 Anisopterid dragon-fly nymph.

No. 5.—9 January, 1931. Weight about ½ lb.—Hemiptera: 30 water striders, immature (*Gerris* sp.), 4 plant bugs (? spp.). Hymenoptera: 4 ants (? spp.). Trichoptera: 1 caddis fly. Ephemeroptera: 1 May-fly. Lepidoptera: 1 Lepidopterous larva.

No. 6.—Trichoptera: 2 caddis larvæ. Vermes: 2 intestinal worms.

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EXPLANATION OF PLATE XVII.

Figure 1.—Stomach of Rainbow Trout (No. 27) (*Salmo irideus*, Gibbons), from Big Badja River, New South Wales.

Figure 2.—Principal contents of the same stomach.

STUDIES IN ICHTHYOLOGY.
No. 8. *

By

GILBERT P. WHITLEY,

Ichthyologist, The Australian Museum, Sydney.

(Figures 1–3.)

Family SCYLIORHINIDÆ.

Genus Aulohalaelurus (Fowler, 1934).

Orthotype.—*Catulus labiosus* Waite.

Nasal valves separated from each other and from the mouth. No cirrus. Upper labial fold long; lower labial fold extending along lower jaw nearly to symphysis. First dorsal fin situated behind the level of the ventrals. Anal fin opposite the second dorsal; length of base of anal more than its distance from the caudal. No enlarged denticles above caudal fin and no dorsal tubercles. Body with scattered dark spots and a few light ones; cross-bands obscure.

Aulohalaelurus labiosus (Waite).

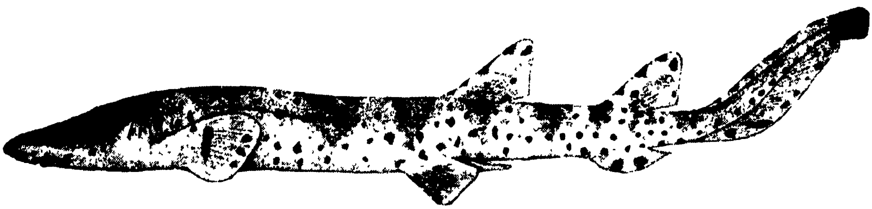

Figure 1.

Aulohalaelurus labiosus (Waite). Holotype. G. P. Whitley del.

Catulus labiosus Waite, Rec. Austr. Mus., vi, 2, Sept. 15, 1905, p. 57, fig. 23. Fremantle, Western Australia. Holotype in Western Australian Museum.

Scyliorhinus maculatus Regan, Ann. Mag. Nat. Hist., (8) i, 1908, p. 462. Ref. to Waite only, as Günther's record is probably based on an *Atelomycterus*. Not *Squalus maculatus* Bloch and Schneider 1801, preocc. by Bonaterre, 1788.

Scyliorhinus maculatum McCulloch, Zool. Res. Endeavour, i, 1911, p. 6.

Scyliorhinus labiosus McCulloch, Austr. Mus. Mem., v, 1929, p. 8. W.A. rec. only.

Mr. L. Glauert, Curator of the Western Australian Museum, kindly permitted me to draw the accompanying figure of the unique holotype of this species when I was in Perth during holidays. As Waite illustrated only the mouth-parts, not the

* For No. 7, see Records of The Australian Museum, vol. xix, No. 1, 1933, p. 60.

whole shark, authors have apparently confused this species with another, perhaps *Atelomycterus marmoratus*, an Australian specimen of which I have previously illustrated[1]. I have been unable to identify the briefly characterized *Squalus cuvier*[2], which seems again distinct. *Aulohalaelurus labiosus* is thus authentically known only from south-western Australia, as the Queensland record of "*Scyllium maculatum*" from "Bramble Bay" evidently applies to some other Scyliorhinid shark.[3]

Family OPHICHTHYIDÆ.

Malvoliophis, gen. nov.

Orthotype, *Bascanichthys hemizona* Ogilby[4] = *Malvoliophis pinguis* (Günther).

Head conical; body elongate, somewhat compressed. Spaced acute teeth occur uniserially on jaws and vomer; the anterior canines of upper jaw lie outside mouth. Nostrils in the form of a perforated cone or tapering tube, not bifid. Dorsal fin commencing over head; anal behind vent, which is in anterior half of fish. Tip of tail free of fins. Pectorals well developed, much longer than snout, and longer than broad. Lateral line curving over opercular region.

Head spotted; body with twenty or more bands, often asymmetrically disposed, which do not extend over the belly.

Generic definition drawn up from New South Wales specimens in the Australian Museum from the following localities:—Newcastle; Rose Bay and Sow and Pigs Reef, Port Jackson; Lady Robinson's Beach and La Perouse, Botany Bay; Bannister Point near Milton; and Bermagui. The species has been recorded from Lord Howe Island by Waite, and Ogilby's name is evidently a synonym of *Ophichthys pinguis* Günther[5] from the Solomons.

This eel cannot be retained in *Bascanichthys*[6] as that American genus has atrophied pectoral fins, bifid nostrils, and other differentiating characters.

Family MURAENIDÆ.

Notorabula, gen. nov.

Orthotype, *Muraena callorhyncha* Günther[7] = *Notorabula callorhyncha*.

Head 3¾ in trunk. Teeth acute; anterior teeth biserial. Eye small. Posterior nostrils not tubular. Coloration not spotted; snout ornamented with brown bands. Dorsal fin commencing behind gill-opening.

Ogilby[8] placed Günther's species in the genus *Rabula* without comment, but it cannot remain in that genus because of the characters noted above. *Rabula* was

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[1] Whitley.—Rec. Austr. Mus., xviii, 1932, p. 322, pl. xxxviii, fig. 1: Port Darwin.
[2] Peron and Lesueur.—Journ. Acad. Sci. Philad., ii, Nov., 1822, p. 351: N.W. New Holland.
[3] Ogilby.—Mem. Qld. Mus., iii, 1915, p. 131 and v., 1916, pp. 77 and 93; McCulloch and Whitley, *ibid.*, viii, 1925, p. 128, as *Halaelurus labiosus*.
[4] Ogilby.—Proc. Linn. Soc. New South Wales, xxii, 2, October, 25, 1897, p. 248: Port Jackson.
[5] Günther.—Ann. Mag. Nat. Hist., (4) x, Dec. 1, 1872, p. 425; Cruise Curaçoa (Brenchley), 1873, p. 43, pl. xxxv. Solomon Is.
[6] Jordan and Davis.—Rept. U.S. Fish. Comm., viii, 1888 (1892), pp. 613 and 621. Orthotype, *Caecula bascanium* Jordan, 1884, from Florida.
[7] Günther.—Cat. Fish. Brit. Mus., viii, 1870, p. 122: Fremantle, Western Australia.
[8] Ogilby.—Proc. Roy. Soc. Qld., xx, Jan. 1907, p. 11.

introduced by Jordan and Davis[9] for species with the dorsal fin inserted behind the head, the genotype being *Muraena aquae-dulcis* Cope, 1872, from Rio Grande, Costa Rica, which was only provisionally identified by Jordan and Davis from their material. The American eel evidently has the dorsal much more posteriorly situated than the Australian and differs also in proportions, dentition, and coloration.

Family CARANGIDÆ.

Genus Olistus Cuvier, 1829.

? *Atropus* Bosc, Nouv. Dict. Hist. Nat., ed. 2, iii, Sept. 1816, p. 64. *Id.* Cloquet, Dict. Sci. Nat. (Levrault), iii, " 1816 " = Jan. 1817, Supplément, p. 82. *Id.* Schinz, Das Thierreich (Cuvier), 1822, p. 521. Haplotype, *Brama atropus* Bloch and Schneider, 1801 = *Atropus ciliaris* Cloquet, 1817, from Tranquebar. Name preoccupied by *Atropos* Oken, 1815, Lepidoptera.

Olistus Cuvier, Règne Anim., ed. 2, ii, April 1829, p. 209. *Genus caelebs.* Logotype, *Olistus malabaricus* Cuvier and Valenciennes, 1833.

Olisthus Agassiz, Nomencl. Zool., 1846, Index Univ., p. 257. Emend. pro *Olistus.*

In the ichthyological portion of the first edition of his *Règne Animal*, published in December 1816 (though the title-page is dated 1817), Cuvier gave many vernacular generic names which were not latinized until later authors or editors provided valid scientific names for them. Usually, Oken has been regarded as having given Latin equivalents for them in the *Isis*, 1817, but Mr. T. Iredale, who has seen Oken's work, informs me that his names are all *nomina nuda*, some being still retained in a vernacular form.[10] Apparently Cuvier's manuscripts had been available to his colleagues, as many of his genera were established by the authors of articles on fishes in the French Dictionaries of Natural History before the *Règne Animal* appeared. The following list of the relevant literature of the period may assist in tracing the first valid use of Cuvier's names. I am unable to consult some of the works of Blainville, Geoffroy de St. Hilaire, Procé, and Desmarest, in which further latinizations may occur.

Sept. 1816 onwards. Bosc and others, Nouv. Dict. Hist. Nat.
Oct. 1816 onwards. Cloquet, Dict. Sci. Nat. (ed. Levrault).
Dec. 1816. Cuvier, Règne Animal, ed. 1, vol. ii.
1820. Goldfuss, Handb. Zool.
1822. Schinz, Das Thierreich (Cuvier), ii.
May 1822 onwards. Bory, Dict. Classique Hist. Nat.
June 1822. Fleming, Philosophy of Zoology.
1824–1825. Quoy and Gaimard, Voy. autour Monde. . . Uranie et Physicienne.
1826. Risso, Hist. Nat. Europe Méridionale, iii.
Oct. 1828 onwards. Cuvier and Valenciennes, Hist. Nat. Poiss.
April 1829. Cuvier, Règne Animal, ed. 2, ii.
1832. Voigt, Das Thierreich (Cuvier) ii and later editions.

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[9] Jordan and Davis.—Rept. U.S. Com. Fish., 1888 (1892), p. 589.

[10] Gill.—Proc. U.S. Nat. Mus., xxvi, 1903, pp. 965-967, discusses Oken's names and his list of them confirms Mr. Iredale's opinion.

Olistus hedlandensis, sp. nov.

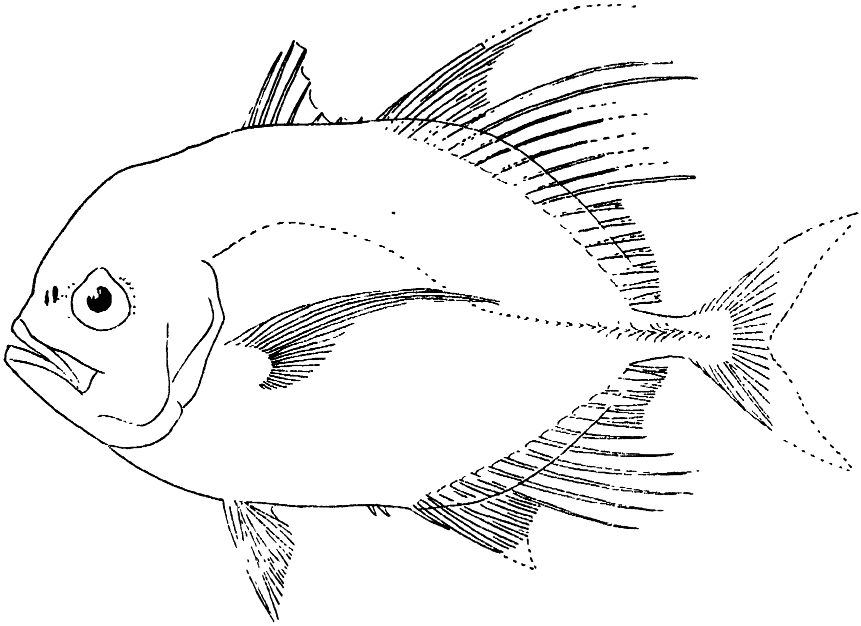

Figure 2.

Olistus hedlandensis, sp. nov. Holotype. A. R. McCulloch del.

D.viii/20; A.ii/i, 16; about 17 scutes on l.lat.

Orbit (13mm.) subequal to snout (14) and about two-thirds postorbital portion of head (21·5). Head (48) 3·3, seventh dorsal ray (60) 2·6, depth of body (86) 1·8 in standard length (160).

Form deep, upper profile gibbous above the eyes. Adipose eyelids well developed. Thirteen gill-rakers, up to 8 mm. long, on lower limb of first branchial arch. Maxillary reaching to below middle of eye. A series of fine teeth on jaws, vomer, and palatines.

Depth of body greater than basal length of soft dorsal or anal fins. Straight portion of lateral line shorter than curved portion. Breast naked.

General colour now faded but still with a blackish blotch on operculum and a fuscous anterior area on the snout. Ventrals blackish and received into a groove on the ventral surface. Neither the groove nor the ventral fins are as long as they are in true *atropus*.

Described and figured from the holotype of the species, a specimen 160 mm. in standard length, or about 8 inches in total length. Austr. Mus. regd. No. I. 12957.

Loc.—Port Hedland, north-western Australia; presented by the Fisheries Department of Western Australia in 1913.

This is apparently the species called *Caranx armatus* by Australian authors, but this is not the *Sciaena armata* which Forskaal [11] described as having the tail dark, apices of dorsal and anal fins black, lateral line straight, etc.

[11] Forskaal.—Descr. Anim., 1775, p. 53: Non-binomial: Red Sea

Indian and Australian specimens labelled as *Caranx armatus* in the Australian Museum have not the produced fin-rays of the type of *Olistus hedlandensis*, but the Fremantle specimen, recorded by Waite and preserved in the Western Australian Museum, has these features. McCulloch noted (MS.) that two specimens named *Caranx armatus* are in the Macleay Museum, University of Sydney, from Cape York, Queensland, and agree with the Port Hedland specimen; of these he wrote: "They have rounded deep bodies, the length from the tip of the upper jaw to the end of the middle caudal rays being 182 mm., while the depth before the second dorsal is 93 mm. in one specimen; the other is almost the same size. They are clearly the same species, but one has nearly all the dorsal and anal rays greatly produced, whereas only the 1st and 6th to 9th dorsal rays are produced in the other, the anal has the usual angular projection but none of the rays are filamentous as in the other specimen. . . . A small specimen in the Macleay Museum from Endeavour River, Queensland, was labelled as *armatus*, but it differs from that species in having a much smaller eye. It is evidently *Caranx chrysophrys*, though it is deeper than shown in either Cuv. and Val.'s or Ogilby's figures. D. ?/i, 20; A.ii/i, 16. Eye much shorter than both snout and postorbital part of head."

Range.—North Queensland, North and Western Australia.

Family **LETHRINIDÆ.**

Genus **Pentapodus** Quoy and Gaimard, 1824.

Pentapodus milii (Bory de Saint Vincent).

Cantharus milii Bory de Saint Vincent, Dict. Classique d'Hist. Nat., iii, 1823, p. 160, pl. xc, fig. 3. Shark's Bay, W. Australia.

Pentapodus vitta Fowler, Bull. U.S. Nat. Mus., 100, xii, 1933, p. 71 (references and synonymy).

Life-colours.—Back dull greyish with two bright blue stripes above lateral line. A blue stripe pointing upward and backward arises from the hind margin of the eye. A blue band commences on the snout and passes along the body to the root of the caudal, where it encloses a dark spot and returns along the middle of the side to the snout, forming the boundary of a broad brown lateral band. Below this, the sides are yellow to silvery with oblique faint pearly spots running upwards and backwards along the scale rows. Dorsal fins greyish, tipped with yellow, and with an inframarginal milky band. Caudal entirely yellow, other fins hyaline. Eye yellowish, with a continuation of the brown and milky blue lateral bands passing through it. D. x/8; A. ii/8; L. lat. *circa* 48.

Described from a live specimen, netted at Geraldton, Western Australia, in August 1933. The earliest name for this species is that given by Bory de Saint Vincent about a year before *Pentapodus vitta* Quoy and Gaimard was published.

The *Cantharus dubia* of Bory is apparently another species of *Pentapodus*, of which *Mesoprion emeryi* Richardson may be a synonym; it is apparently not *Pentapodus peronii* nor *porosus* Cuv. and Val. Further collecting in the little known waters of north-western Australia would be desirable to bring to light more specimens of these puzzling species.

Family **BOTHIDÆ.**

Genus **Pseudorhombus** Bleeker, 1862.

Pseudorhombus guttulatus Macleay.

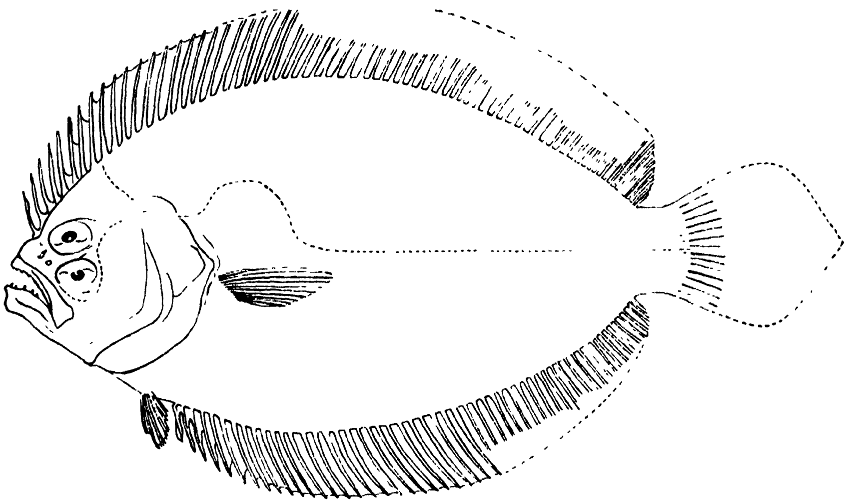

Figure 3.

Pseudorhombus guttulatus Macleay. Holotype. G. P. Whitley, del.

Pseudorhombus guttulatus Macleay, Proc. Linn. Soc. N. S. Wales, viii, 2, July 17, 1883, p. 276. Hood Bay, New Guinea. Type in Australian Museum.

Pseudorhombus guttulatus was briefly described, without illustration, by Macleay, as follows :—

> " D.75. A.63.
>
> The height of the body is nearly half the total length. The dorsal fin commences in front of the eyes, which are large, almost in the same plane, and separated by a narrow ridge. Teeth acute, sloping backwards. Colour (in spirits), uniform grey, fins lighter, the whole covered with minute brown dots. Length, 4 inches.
>
> Hood Bay."

To fulfil the requirements of modern ichthyologists, it seems desirable to redescribe and figure Macleay's type specimen with a view to determining the status of his species. Counts of fin-rays and scales and most measurements have been made under a Zeiss binocular microscope, which reveals 72 dorsal and 57 anal rays, not 75 and 63 as given by Macleay, who had no such mechanical aid.

D.72; A.57; P. *dex. et sin.* 12; V. *dex. et sin.* 6; C.16. L.lat. 24 on curve + 54 on straight portion = 78 on left (ocular) side and 31 + 53 = 84 on right (blind) side. Gill-rakers 9 on lower part of first branchial arch of left side.

Head (24 mm.) 3·4, depth of body (43) 1·9 in standard length (82). Snout (5·5) slightly longer than eyes (5), half the length of upper jaw (10) which is equal to depth of caudal peduncle (10) and 2·4 in head; mandible (7) 3·4 in head.

General form lenticular; head (behind the eyes) and body scaly. Interorbital a raised ridge, its axis oblique. Profile notched before upper eye. Maxillary reaching to below middle of eyes, its dilated portion scaly. Jaws with spaced, pointed, backwardly directed teeth, which are fewer and larger in the lower jaw, but the mouth has been mutilated so their number cannot be given and the anterior teeth are missing. Anterior nostril with a cutaneous flap; posterior nostril a deep ovate orifice. A line joining the origin of the dorsal fin to the posterior nostril on the blind side, when produced, passes over the anterior part of the maxillary. The gill-rakers of the first branchial arch are like antlers, about 1·5 mm. long, and about three times as long as broad, but tapering and with four processes superiorly.

Between seventy and eighty scales in a longitudinal series from upper angle of gill-opening to root of tail. There are 81 pores on the lateral line on the blind side between the operculum and the hypural. Scales ctenoid on the left side and cycloid on the right. Nuchal branch of lateral line ascending to between the eighth and ninth dorsal rays on the left side and between ninth and tenth on blind side.

Dorsal fin originating just above posterior nostril on blind side, its anterior rays not produced. Preanal spine short and beneath the skin. The fins have been somewhat damaged, but the hindmost dorsal and anal rays are apparently branched. Ventrals symmetrical; right pectoral slightly shorter than left.

The colour, after long preservation, is uniform brown with some dark speckles on the dorsal and anal fins. No ocelli are visible and Macleay only mentioned "minute brown dots."

Described and figured from the unique holotype, a specimen 82 mm. in standard length or about four inches overall.

Loc.—Hood Bay, south-eastern Papua. Presented by the Committee of Management, Macleay Museum, University of Sydney, to the Australian Museum in 1907. Registered No. I.9180.

Pseudorhombus guttulatus is apparently a valid species, for, although it approaches some species, such as *polyspilos*, the extent of the maxillary, proportion of depth to length, and other characters serve to distinguish it.

Mr. J. R. Norman has very kindly sent me proofs of the *Pseudorhombus* portion of his monograph but *guttulatus* cannot be exactly identified with any species in his key.

Incidentally, Mr. Norman has also sent me copies of Sauvage's descriptions of some Australian Gobies which enable me to classify the species as follows:—

1. *Gobius suppositus* Sauvage 1880 = *Glossogobius vomer* Whitley, 1929 = *Glossogobius suppositus*. Swan River, Western Australia.
2. *Gobius infaustus* Sauvage 1880 = *Gobius bassensis* Castelnau 1872 = *Arenigobius bifrenatus bassensis*. Melbourne, Victoria.
3. *Gobius olorum* Sauvage 1880 = *Lizagobius olorum*. Swan River, Western Australia. Very like *galwayi* McCulloch and Waite 1918 from South Australia.

My thanks are gratefully extended to Mr. Norman for his kind interest and assistance.

Family **BLENNIIDÆ.**

Genus **Crenalticus** Whitley, 1930.

Crenalticus kingii (Cuv. and Val.).

Salarias kingii Cuvier and Valenciennes, Hist. Nat. Poiss., xi, July 1836, p. 334. North-west coast of New Holland (Captain P. King, 1821).

In the Public Library, Perth, Western Australia, there are exhibited several original drawings and paintings by Captain P. P. King, who in 1817–1822 voyaged in the *Mermaid* and *Bathurst* to survey the tropical and western coasts of Australia. Amongst these are pictures of aborigines, butterflies, the Frilled Lizard, shells, and fishes. The latter were mostly done at Porto Praya and exhibit excellent draughtsmanship. King carefully showed the fin- and scale-counts, and it is a pity that he did not illustrate some of the zoological memoirs of his period. One unfinished drawing is of a blenny and evidently represents the type of *Salarias kingii*, which is so far known only from Cuvier and Valenciennes' description, which may now be supplemented as follows:—

D.13/23;. A.24; P.12; V.2 or 3; C.12. Head (20 mm.) 4·9 in standard length (98·5). Depth of body (16) somewhat less than length of middle caudal rays (18) or of pectoral (19). Narial tentacle (2) and ocular tentacle (3) less than eye (4). Base of crest (10) 2 in head. Base of first dorsal fin, 29 mm.; of second, 49; of anal, 56.

The teeth are small; the presence or absence of canines cannot be determined. Ocular and narial tentacles branched. Upper lip entire and apparently very thick. This lack of crenulation of the upper lip, shared with *Salarias meleagris* Cuv. and Val., may require *meleagris* and *kingii* to be separated subgenerically from *Crenalticus*; "*Alticus*" and *Rupiscartes* being generically distinct again.

Dorsal spines much curved, slightly longer than the rays. The last dorsal spine is less than half the length of the others and a notch is thus formed between the two fins. The ninth to last dorsal rays are branched. Second dorsal joined to caudal. Anal free and originating below ninth or tenth dorsal spines.

Captain King's drawing has not been coloured but there are three faintly hatched subhorizontal bands on side of head and some dots along base of dorsal fin.

Family **TETRAODONTIDÆ.**

Omegophora, gen. nov.

Orthotype, *Tetraodon armilla* Waite and McCulloch[12] = *Omegophora armilla*.

Form robust; no fold along the lower portion of the sides and caudal peduncle not depressed. Anterior profile of head oblique; interorbital very slightly sunken. Lips papillose. Eye entirely attached to skin of side of head. Nostrils with rounded margins, somewhat leaf-shaped, without apertures. Gill-opening without spurs or crenulations.

Back, sides, and belly with inconspicuous spines. · Lateral line system indistinct. Fins all rounded.

[12] Waite and McCulloch.—Trans. Roy Soc. S. Austr., xxxix, 1915, p. 475, pl. xv: Great Australian Bight. Holotype in S. Australian Mus., Adelaide.

Face and lower part of tail fuscous. Body without spots, bars, or striking colour-pattern except for a conspicuous black arch almost encircling the gill-opening and pectoral base.

Generic definition drawn up from paratypes of *armilla* in the Australian Museum. *Omegophora* is very different from *Tetraodon* Linne,[13] the genotype of which, *T. lineatus*, from the Nile, was selected by Lesson.[14] Boulenger[15] figures this species, which is distinguished from the Australian one by having very different proportions, prickly body, striped coloration, more distensible belly, more fin-rays, well-marked lateral line system and convex interorbital.

The generic name *Gnathodon* was employed in ichthyology by Goldfuss in 1820 for the group embracing *Diodon* and *Tetraodon*, according to Cuvier and Valenciennes [16], whilst Sherborn's " Index Animalium " gives an earlier reference to Oken. *Gnathodon* has been generally overlooked and is best disposed of by being consigned to the synonymy of *Diodon*.

Family **ALEUTERIDÆ.**

Genus **Meuschenia** Whitley, 1929.

Meuschenia skottowei, sp. nov.

" *Unicorn Fish or Leather Jacket* " Skottowe, Select Specimens New South Wales (unpublished Ms. in Mitchell Library, Sydney, dated 1813), Fish No. 10, pl. xlvi, fig. 10. Newcastle, New South Wales. Native name : Yuagunyang.

Monocanthus J. Stuart, unpublished drawings in Linn. Society New South Wales Library, dated 1841, Nos. 122 and 146. Quarantine Station, Port Jackson, New South Wales.

Monacanthus freycineti Hollard, Ann. Sci. Nat., (4) ii, 1854, p. 336. New South Wales specimen only. Not *Balistes freycineti* Quoy and Gaimard, 1824, from Mauritius.

Aleuterius variabilis Bleeker, Nederl. Tijdschr. Dierk., ii, 1865, p. 69. Port Jackson. Not *A. variabilis* Richardson, Zool. Voy. Erebus and Terror, 1846, pp. viii and 67, pl. liii, figs. 1–7, from King George's Sound.

Monacanthus hippocrepis Steindachner, Sitzb. Akad. Wiss. Wien, lvii, 1868, p. 1002. *Id.* Günther, Cat. Fish. Brit. Mus., viii, 1870, p. 246 (Sydney rec. only). *Id.* Castelnau, Proc. Linn. Soc. New South Wales, iii, 1879, p. 399. *Id.* Schmeltz, Cat. Mus. Godef., vii, 1879, p. 62. *Id.* McCoy, Prodr. Zool. Victoria, dec. xiii, 1886, p. 95, pl. cxxv (Port Phillip, Victoria). *Id.* Ogilby, Cat. Fish. New South Wales, 1886, p. 62 and Ed. Fish. New South Wales, 1893, p. 194, pl. xlviii. *Id.* Stead, Fish. Austr., 1906, p. 222, fig. 78 and Ed. Fish. New South Wales, 1908, p. 118, and of authors dealing with eastern Australian specimens. Not *Balistes hippocrepis* Quoy and Gaimard, Voy. Uranie, Zool. 1824, p. 212, from Mauritius, described as blackish, with very movable ventral spine; see also Hollard, Ann. Sci. Nat., (4) ii, 1854, p. 338.

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[13] Linne.—Syst. Nat. ed. 10, 1758, p. 332.
[14] Lesson.—Dict. Classique d'Hist. Nat. xvi, 1830, p. 198.
[15] Boulenger.—Cat. Fresh-water Fishes of Africa Brit. Mus. iv, 1916, p. 143.
[16] Cuvier and Valenciennes.—Hist. Nat. Poiss., i, Oct., 1828, p. 226.

? *Monacanthus castelnaui* Macleay, Proc. Linn. Soc. New South Wales, vi, 1881, p. 316. New name for *M. peronii* Castelnau, ibid. iii, 1879, p. 398, not of Hollard. "Body covered with papillæ having rather the form of small mushrooms." Port Jackson.

Pseudomonacanthus hippocrepis Waite, Mem. New South Wales Nat. Club, i, 1904, p. 56.

Cantherines hippocrepis McCulloch, Austr. Zool., ii, 1922, p. 126; Austr. Zool. Handbook, i, 1922, p. 100 (not fig.).

Meuschenia hippocrepis McCulloch, Austr. Mus. Mem., v, 1929, p. 416 (Eastern Australian records only). *Id.* Barrett, Water Life, 1933, pp. 23 and 31, coloured fig. 7.

Cantherhines freycineti McCulloch, Austr. Mus. Mem., v, 1929, p. 418. Not *Balistes freycineti* Quoy and Gaimard, 1824.

D. ii/38; A. 35; P. 14.

Depth at origin of dorsal and anal fins (94 mm.) 2·7, maximum length of head (79) 3·2, in length to hypural joint (255). First dorsal spine (52) 1·5, gill-opening (23·5) 3·3, and caudal peduncle (39) 2 in head. Eye (15) 4·2, interorbital (21·5) 2·9 in snout (63).

General form elongate-ovate; upper profile of head slightly convex and chin somewhat protruding. Skin very rough to the touch. Each scale gives rise to several spines and rugosities, but none of these is mushroom-shaped. A bristly area is formed anterior to the caudal spines but it is not so brush-like as in some Leatherjackets. In many places the scales are indistinguishable, the integument being beset with very small spines which extend over the caudal fin. Six strong antrorse spines on the caudal peduncle, which is shorter than the interdorsal space. Ventral spine present as an immovable rugose knob.

Fins evenly rounded, not angulate. Caudal bisinuate.

General colour (in alcohol) olivaceous or greyish, with some bluish lines crossing the cheeks and flanks and extending along the body near the bases of the dorsal and anal fins and around the upper part of the caudal peduncle. A large, irregular, bluish and brown or orange blotch on each side of body. Caudal spines orange. First dorsal membrane dark blue; rest of fins yellowish, the caudal crossed by a prominent black band.

Described from the holotype of the new species, a specimen 255 mm. in standard length or 12 inches in total length.

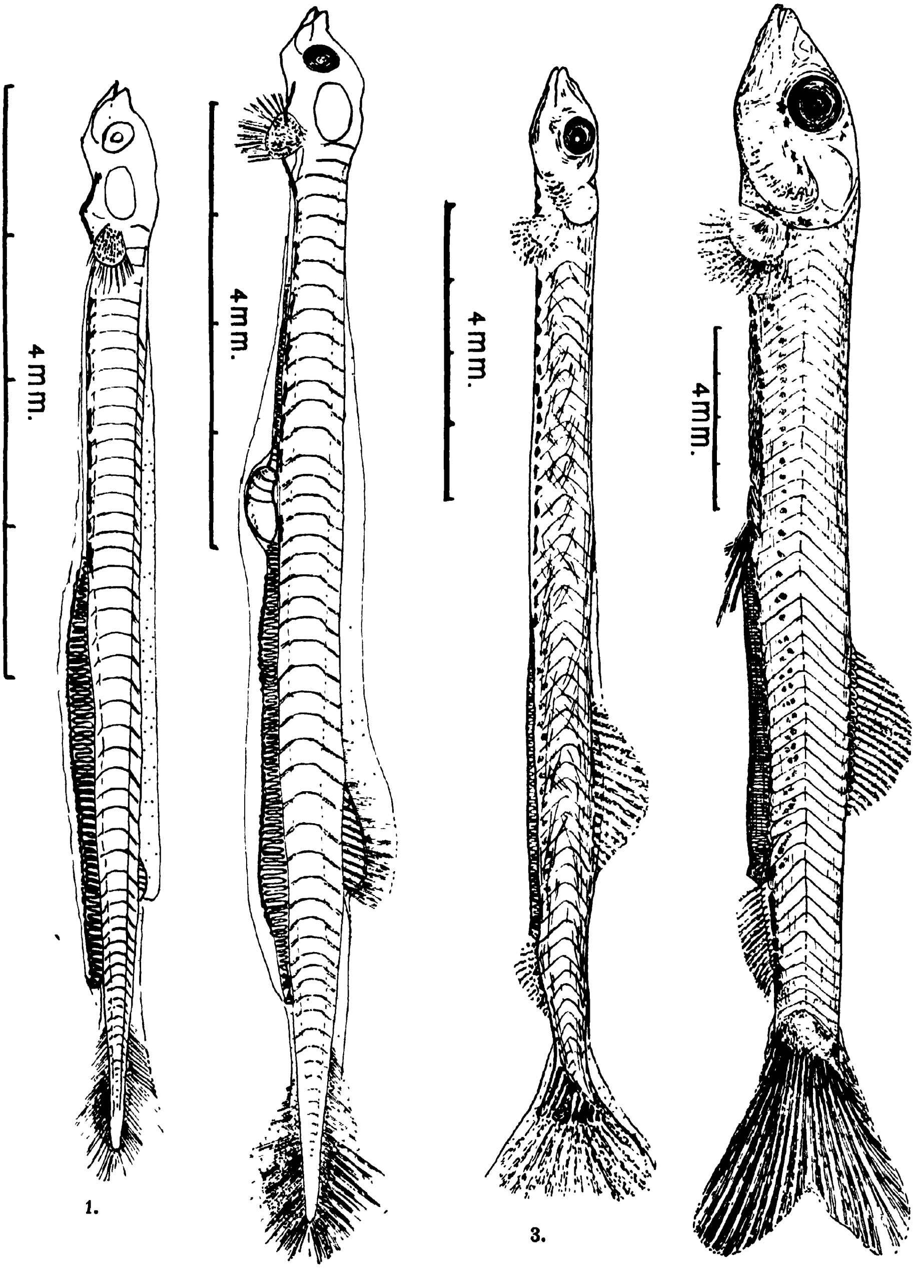
Loc.—Long Reef, Collaroy, New South Wales; April, 1933 (M. Ward). Austr. Mus. regd. No. IA 5698.

This species is the Orange-spotted or Variable Leatherjacket of New South Wales which grows to a length of about eighteen inches. This fish has been said to be very variable in colour, a horseshoe mark being either present or absent on the sides, but all the many local specimens I have seen had merely an irregular blotch which in no wise resembled a horseshoe, as is seen in southern or western Australian specimens identified as *Cantherines hippocrepis*, and as figured by McCoy. Thus the New South Wales form evidently belongs to a hitherto undescribed species, distinguished by its elongate-ovate form with convex profile and protruding chin, coloration, etc.

Specimens are in the Australian Museum from Port Stephens, Broken Bay, Pittwater, Elizabeth Bay and Port Jackson generally, Long Reef, Coogee, Botany Bay, and Eden, New South Wales.

Named in honour of Lieutenant Thomas Skottowe, who was appointed Commandant at Newcastle, New South Wales, in 1811, and who employed T. R. Browne to paint the animals of the district. Their manuscripts and paintings, dated 1813, are in the Mitchell Library, Sydney, and the fishes include the first illustration I have been able to discover of *Meuschenia skottowei*. Some even better paintings of this species were prepared by Dr. James Stuart almost a century ago and are now in the library of the Linnean Society of New South Wales.

Sydney: Alfred James Kent, I.S.O., Government Printer—1934



W. J. DAKIN and A. N. COLEFAX, del.

MINERALOGICAL NOTES, No. V. *

By

T. Hodge-Smith,

(Mineralogist and Petrologist, The Australian Museum.)

CONTENTS.

Stolzite.

Broken Hill, New South Wales.

(Figures 1–4.)

A number of interesting specimens of stolzite from a new find at Broken Hill, New South Wales, were collected by Mr. M. Mawby and obtained by exchange for the collection of this Museum. All the material was secured from Section Ce, 525 feet level, South Mine, Broken Hill.

The discovery of stolzite in this mine is of particular interest in view of the statement of Mr. Geo. Smith [1] that stolzite was peculiar to the Proprietary Mine, and that it was found only in the upper portion of the oxidised zone. Mr. Smith's description applies only to the upper and oxidised portion of the Broken Hill lodes.

The paragenesis of the mineral in the South Mine appears to be distinct from that of the stolzite found in the Proprietary; according to Smith, the associated minerals in the latter case are manganic ironstone and quartz or garnet sandstone, though Hlawatsch [2] records one specimen in which the crystals are seated on decomposed galena. In the South Mine the associated minerals are secondary galena, stalactitic smithsonite, and cerussite.

The colour of the mineral varies from colourless to very pale grey. Colourless crystals in the Proprietary are rare, and are always tabular in habit.

The habit of the crystals in the Proprietary Mine has been summarised by Mr. G. W. Card [3] as follows:—

" (*a*) Flattened, leaden-grey, tetragonal pyramids, with little or no prism.

(*b*) Leaden-grey tetragonal prisms with low pyramids.

(*c*) Claret-coloured pyramidal forms, perhaps hemihedral.

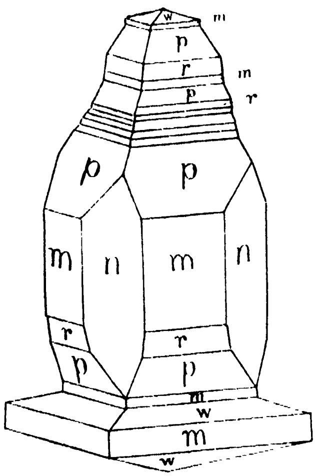
(*d*) Colourless or white crystals with adamantine lustre; very tabular in habit . . . "

* For No. IV, see " Records of the Australian Museum," vol. xvii, No. 9, 1930, p. 408.
[1] Smith.—Geol. Surv. New South Wales, Min. Res. No. 34, 1926, pp. 88-89, 105.
[2] Hlawatsch.—Ann. K. K. Naturh. Hofmus. Vienna, xii, p. 33.
[3] Card, G. W.—Rec. Geol. Surv. New South Wales, v, 1897, p. 121.

*36368—A

There appears to be no further description of the habit of the first type recorded, and in order to find out what pyramid is represented a crystal was selected for measurement, and the form established as the second order tetragonal bi-pyramid d (013) (Figure 4). Unfortunately, I was unable to obtain any crystals of the second type suitable for measurement, so that it is impossible to say which prism is present.

The third type has been described and figured by Hlawatsch,[4] and also by Glastonbury and Semmens.[5]



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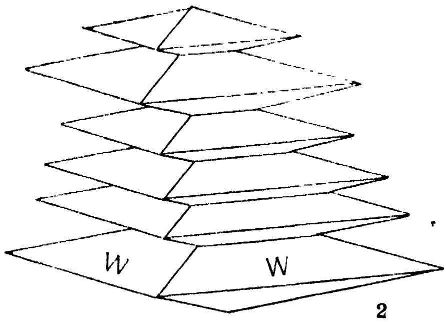

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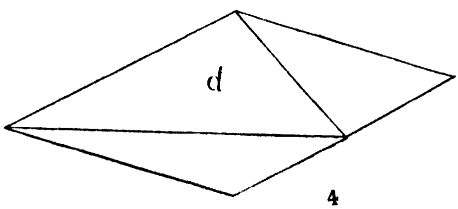

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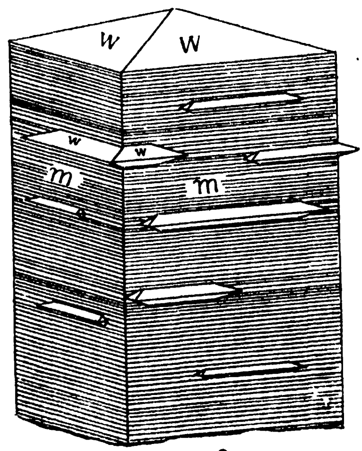

3

Figures 1-3.

Stolzite, South Mine, Broken Hill, New South Wales. Forms: m (110), n (130), p (111), w (117), and a new form, r (441).

Figure 4.

Stolzite, Proprietary Mine, Broken Hill, New South Wales. Form: d (013).

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[4] Hlawatsch.—*Loc. cit.*

[5] Glastonbury and Semmens.—Proc. Roy. Soc. S. Austr., lii, 1929, pp. 259–260.

Mr. H. F. Whitworth, of the Geological Survey of New South Wales, very kindly supplied a crystal of the fourth type for purposes of measurement. This crystal proved to be tabular on the basal plane, with the edges bevelled by the second order tetragonal bi-pyramid e (011). The prism m (110) was the only other form present, and it was represented by an extremely narrow face only.

The crystals from the South Mine exhibit two distinct habits, (*a*) the flat pyramidal type and (*b*) the prismatic type. These appear at first sight to belong to Card's first two types from the Proprietary Mine, but the important difference is that the crystals of the South Mine possess first order forms, while those from the Proprietary are of the second order.

In the crystals from the South Mine there is a gradation, or, perhaps, more correctly, an oscillation between the two types. The pyramidal type often occurs as groups of individuals in parallel growth with their c-axes co-linear. Generally, the prism forms are completely absent in this type, but in some cases they are present as narrow faces. Occasionally a crystal of this type is seated on one of the prismatic type in such a manner as to be similarly oriented. In one or two crystals of the prismatic type pyramids project from the prism faces in position of parallel growth. Invariably the prism faces are striated horizontally, and give blurred or multiple signals, and often the crystals are tapering owing to an oscillation of the pyramids and prisms. The prismatic type is always terminated by the same flat pyramid of the first type. During the deposition of the crystals there appears to have been a fairly rapid oscillation of conditions of crystallisation capable of producing one or other type.

Among the specimens examined were a number of irregular crusts or plates of stolzite, which are formed by the junction of a number of crystals of the flat pyramidal type, so arranged that their c-axes are nearly but not quite parallel.

(*a*) Flat Pyramidal Type (Figure 2).—The crystals of this type consist of the first order tetragonal bi-pyramid w (117), which is a rare form, and has been previously recorded only from Ozieri, Sardinia, by Artini [6]. Occasionally there is a rounding of the edges w : w producing a rounded second order tetragonal bi-pyramid, which could not be determined. In some of the larger crystals the prism m (110) was present, and in one of the crystals the form n (130) was recognised. This appears to be a somewhat rare form, but was first recorded by Emerson [7] in 1895 from Laudville, Massachussetts, U.S.A.

The crystals were measured on a two-circle goniometer, but no really good results were obtained. When the prisms are present they give only blurred signals, while the pyramidal form gives no signal at all, owing to a very fine etching of the faces. In order to obtain measurements of the flat pyramid, two of the larger crystals were selected and small pieces of cover glass (as used for microscope slides) were temporarily cemented to the faces by moisture. The average measured ρ angle is 17° 13′, and the limits of the readings are 17° 06′ and 17° 34′. The calculated ρ angle is 17° 30′. The interfacial angle was measured on one of the prismatic crystals, where the form was found to lie in the zone 110 : 001. The crystals varied in size from 1 mm. to 8 mm. square.

[6] Artini.—Rend. Inst. Lomb. Milan, xxxviii, 1905, p. 373.
[7] Emerson.—U.S. Geol. Surv., Bull. 126, 1895, p. 163.

(*b*) Prismatic Type (Figures 1 and 3).—The prism m (110) always gives a series of blurred signals. The faces are horizontally striated, often alternate with the pyramids noted below, and are generally tapered, varying from the normal position by as much as 5°. A prism often having faces larger than those of the form m (110) is very characteristic of these crystals. It is not striated, but is always very dull, giving no signal and making it necessary to use the position of maximum illumination, so that accurate results could not be hoped for. The weighted average measured φ angle for twelve readings is 18° 40′, and the limits are 17° 41′ to 20° 10′. There can be little doubt that this corresponds to the rare form n (130). The only pyramids recognised are the first order tetragonal bi-pyramids, of which p (111) always gave good to fair signals. In every case this form was used for the purpose of centering the crystals. Another pyramid, present on all the crystals measured gave an average measured ρ angle of 83° 49′, with limits of 83° 31′ to 83° 52′. This corresponds to an unrecorded form r (441) with a calculated ρ angle of 83° 32′. The crystals were invariably terminated by the form w (117), which is finely etched, and gives no signal as in the case of the flat pyramidal type.

Some of the crystals were doubly terminated. They varied in size from 0·5 mm. x 1 mm. to 7 mm. x 12 mm., measured along the *a* and *c* axes respectively.

The following table gives the measured and calculated φ and ρ angles :—

Form.	Measured.		Calculated.		Error.	
	φ	ρ	φ	ρ	φ	ρ
	° ′	° ′	° ′	° ′	′	′
m (110) ...	44 56	88 02	45 00	90 00	4	118
n (130) ...	18 40	...	18 26	90 00	14	...
p (111) ...	44 56	65 36	45 00	65 43	4	7
r (441)* ...	44 50	83 49	45 00	83 32	10	17
w (117) ...	44 27	17 13	45 00	17 30	33	17

* New form.

Vanadinite.

Broken Hill, New South Wales.

(Figure 5.)

The collection of fossils and minerals of the late John Mitchell, purchased by the Trustees of this Museum, contained a few specimens of Broken Hill minerals consisting of the rarer species collected in the early days of Broken Hill. Among these is a small specimen of rather pale ruby-red crystals, seated on a mass of calcite with limonite. Unfortunately, the name of the mine from which the specimen came is not recorded. According to Mr. Geo. Smith [8] the vanadinite was most frequently found in the Proprietary Mine, but was also seen in other mines. In the Consols Mine the vanadinite was confined to the vughy portions of the lode, of which pseudomorphs of limonite after calcite formed a part. So that it is probable that this is the mine from which the specimen was obtained.

[8] Smith.—*Loc. cit.*, pp. 50 and 89.

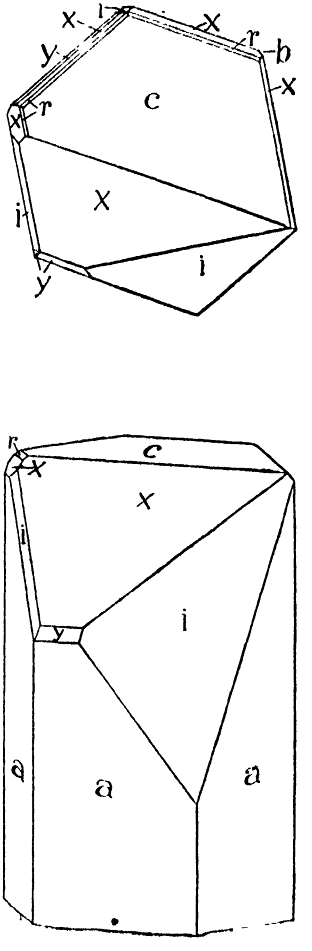


Figure 5.

Orthographic and clinographic projections of vanadinite, Broken Hill, New South Wales. Forms: c (0001), a (10$\bar{1}$0), b (11$\bar{2}$0), r (10$\bar{1}$2), x (10$\bar{1}$1), y (20$\bar{2}$1), i (21$\bar{3}$1).

Unfortunately, many of the crystals were broken, but one complete crystal was secured and measured on a two-circle goniometer with the following results :—

Form.	Measured.		Calculated.		Error.	
	φ	ρ	φ	ρ	φ	ρ
	° ′	° ′	° ′	° ′	′	′
c (0001) ...	...	0 00	...	00 00	0	0
a (10$\bar{1}$0) ...	0 02	89 57	30 00	90 00	2	2
b (11$\bar{2}$0) ...	30 00	89 55	30 00	90 00	0	5
r (10$\bar{1}$2) ...	0 00	22 18	0 00	22 21	0	3
x (10$\bar{1}$1) ...	0 04	39 30	0 00	39 26	4	4
y (20$\bar{2}$1) ...	0 02	58 43	0 00	58 42	2	1
i (21$\bar{3}$1) ...	19 07	65 18	19 06	65 19	1	1

Generally, the faces are all bright, giving fair to excellent signals. The arrangements of the terminal faces is peculiar owing to the unequal development of the faces on one half of the termination. The existence of a large face of the form x (10$\bar{1}$1) gives to the crystal a monoclinic appearance.

Iridosmine.

Barraba, New South Wales.

Mr. F. Cook brought in a sample of a tin-white metallic mineral, which he had collected along with gold in the "dish" while working an alluvial gold deposit at a locality 4 miles south-east of Barraba, New South Wales. In all, the material weighed a little less than 2 grams. Qualitative chemical tests proved the mineral to be iridosmine. It occurred as small flat grains with a very distinct cleavage. The specific gravity as determined by Mr. R. O. Chalmers is 18·02.

The locality lies within the Great Serpentine Belt of New South Wales, as described by Professor W. N. Benson [9], and is a new occurrence of iridosmine in New South Wales. Although no deposits of commercial importance are known in New South Wales, the mineral has been recorded from several localities [10]. It is of interest to note that the presence of iridosmine in much of the gold won in New South Wales has been long known, which fact was first recorded by A. Leibius [11].

[9] Benson.—Proc. Linn. Soc. New South Wales, xlii, 1917, pp. 223–283.

[10] Anderson.—Geol. Surv. New South Wales, Min. Res. No. 22, 1916, p. 68.

[11] Leibius.—Trans. Phil. Soc. New South Wales, 1862–1865, p. 210.

Cassiterite.

Storey's Creek, Tasmania.

(Figures 6–8.)

Recently over one hundred crystals and crystal fragments of cassiterite from Storey's Creek, Tasmania, were added to the collection of the Australian Museum. Storey's Creek is situated in the tin-mining district of Ben Lomond.

In 1901, G. A. Waller[12] reported on this field, describing the various leases, including that of the Storey's Creek Tin-mining Company. So far as I am able to discover, cassiterite crystals from Tasmania have not been figured before, though a description of crystals from Ben Lomond and Mount Bischoff has been given by W. Kohlmann[13], who states that crystals from Ben Lomond are of the pyramidal type, with the prism forms only poorly represented.

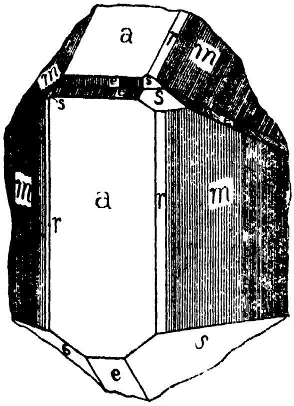
In all the crystals received from Storey's Creek the faces of the prism zone are the dominant ones. The crystals are almost invariably twinned, but are never complete. The matrix attached to some of the larger crystals appears to be somewhat decomposed felspar. The largest crystal measures 45 mm. x 35 mm. x 30 mm., but only two others are comparable with this one, the remainder varying from 15 mm. to 5 mm. measured in the longest direction. The colour is black, with an occasional tinting of ruby or resin.

Many of the crystals were either too large or too fragmentary for measurement on a two-circle goniometer, but ten were selected for measurement, and twelve forms have been recognised. The forms present on the individual crystals are shown in the following table :—

Form.	Crystals.									
	i	ii	iii	iv	v	vi	vii	viii	ix	x
c (001) ...					×	×	×			
a (010) ...	×	×	×	×	×	×	×	×	×	
m (110) ...	×	×	×	×	×	×	×	×	×	×
A (780) ...							×			
B (570) ...							×			
r (230) ...	×	×	×	×	×	×	×	×	×	
h (120) ...					×	×	×	×	×	
e (011) ...	×	×	×	×	×	×	×	×	×	
δ (223) ...										×
s (111) ...		×	×	×	×	×	×	×	×	×
ρ (221) ...										×
μ (676) ...		×					×			

The forms m (110) and s (111) generally gave good signals, while a (100)' h (120), and e (101) gave very fair signals, and B (570) and μ (676) only fair signals; the remaining forms c (001), r (320), A (780), δ (223), and ρ (221) yielded either blurred or bad signals.

[12] Waller, G. A.—Report on Tin-mining District of Ben Lomond, Dept. of Mines, Tas., 1901.
[13] Kohlmann, W.—Zeits. Kryst., xxiv, 1895, pp. 351–365.



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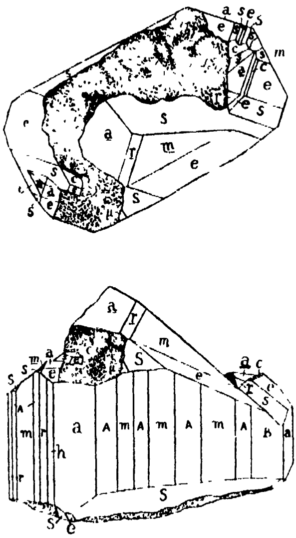

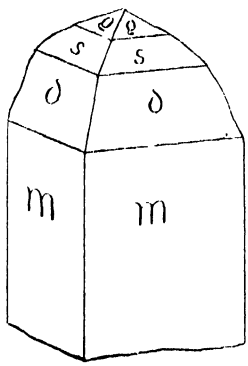

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Figure 6.

Knee-shaped twin of cassiterite, Storey's Creek, Tasmania. Forms: a (010), m (110), r (230), e (011), and s (111).

Figure 7.

Orthographic and clinographic projections of an interpenetration twin of cassiterite, from Storey's Creek, Tasmania. Forms: c (001), a (010), m (110), A (780), B (570), r (230), h (120), e (011), S (111), and μ (676).

Figure 8.

Cassiterite, Storey's Creek, Tasmania. Forms: m (110), δ (223), s (111), and ϱ (221).

The following table gives the average observed and calculated φ and ρ angles :—

Form.	Measured.		Calculated.		Error.	
	φ	ρ	φ	ρ	φ	ρ
	° ′	° ′	° ′	° ′	′	′
c (001) ...	...	0 00	...	0 00	...	0
a (010) ...	0 06	90 01	0 00	90 00	06	01
m (110) ..	44 58	90 00	45 00	90 00	02	00
A (780) ...	41 12	90 00	41 11	90 00	01	00
B (570) ...	35 05	90 00	35 32	90 00	27	00
r (230) ...	33 47	89 54	33 41	90 00	06	06
h (120) ...	26 36	90 00	26 34	90 00	02	00
e (011) ...	0 05	33 55	0 00	33 54	05	01
δ (223) ...	45 00	62 47	45 00	62 15	00	32
s (111) ...	44 56	43 31	45 00	43 33	04	02
ϱ (2̇21) ...	45 00	32 22	45 00	32 22	00	00
μ (676) ...	40 08	46 08	40 36	45 56	28	12
$\underline{c}$ (001) ...	0 32	67 21	0 00	67 48	32	27
$\underline{a}$ (010) ...	0 07	22 09	0 00	22 12	07	03
$\underline{m}$ (110) ..	20 39	49 05	20 41	49 06	02	01
$\underline{A}$ (780) ...	24 34	45 43	23 30	45 32	64	11
$\underline{r}$ (230) ...	29 28	39 45	29 32	39 36	04	09
$\underline{h}$ (120) ...	37 08	34 04	37 05	34 06	03	02
	10 50	65 19	10 41	65 32	11	13
$\underline{e}$ (011) ...	0 56	34 26	0 00	33 54	56	32
	45 03	43 38	45 00	43 33	03	05
$\underline{s}$ (111) ...	29 21	79 48	29 40	79 48	19	00

The crystals examined exhibit three distinct habits :—

(i) Knee-shaped twins, including crystals 1–6.
(ii) Interpenetration twins, including crystals 7–9.
(iii) Simple crystal, represented by crystal 10 only.

(i) The knee-shaped twins (Figure 6) are by far the most common type. They are always more or less fragmentary owing to the mode of attachment, and for this reason they were mounted on the goniometer with an a (010) face polar. They are generally doublets, and only rarely are triplets found. The three large crystals mentioned previously belong to this type. These crystals are very similar in habit to those described by Dr. Marie Bentivoglio [14] from the Stannum District, New South Wales.

[14] Bentivoglio, M.—Journ. Roy. Soc. New South Wales, xl, 1921, p. 78, fig. 3.

The forms e (011) and s (111) frequently oscillate one with the other, and when such oscillation is not present the form e (011) is invariably striated. The prism forms, with the exception of a (010), are all more or less vertically striated.

(ii) The interpenetration twins (Figure 7) are comparatively rare. They are characterised by the presence of a complete prism zone and by being doubly terminated, though neither termination is ever complete. In two of the crystals measured it was found that one termination showed no evidence of twinning whatever, but the other termination consists of several individuals, some in the twinned position and some in position of parallel growth.

The crystal figured is terminated at one end by at least two individuals in parallel position, two twinned individuals in parallel position, and one twinned on a different axis from the other two, while the other termination, though not complete, is a single individual. The arrangement of the faces of the prism is also peculiar insofar as the forms A (780), B (570), r (230), and h (120) appear on only one-half of the zone, while the other half consists of the forms a (010) and m (110) only.

(iii) The simple crystal (Figure 8) is represented by one crystal only. It is a fragment, and was attached to another crystal, but not in the twin position. It is a square prism, terminated by the first order bi-pyramids δ (223), s (111), and ϱ (221). The only prism form present is m (110).

Purpurite.

Euriowie Range, New South Wales.

Mr. M. Mawby forwarded a number of pieces of a mineral which he suggested was purpurite. The material was obtained from near the Crown Mine, Euriowie Range, New South Wales. According to Mr. Mawby the mineral occurs only as a thin vertical seam less than an inch wide in a lithia-bearing albite pegmatite, and is evidently an alteration product of lithiophyllite.

Intimately associated with the mineral, and apparently a decomposition product of it, is a black phosphate with a greyish streak. This material is also found as an extremely thin coating on quartz.

As Mr. Mawby's tentative determination of the mineral as purpurite has been confirmed, and there does not appear to be any record of purpurite as occurring in New South Wales, a short description, together with a partial analysis, by Mr. R. O. Chalmers is given here.

The mineral is very dark reddish-purple in colour, almost black on the cleaved surfaces. In the hand specimen two cleavages approximately at right angles can be detected. They are not perfect. The lustre resembles that of bronzite, though sometimes somewhat dull. The hardness is 4.

Under the microscope a very well-marked parting at 68° to the principal cleavage is seen. It is made more prominent by the presence of a colourless mineral with a high refractive index, low double refraction, and straight extinction, possibly apatite. In places this mineral is replaced by a golden-yellow mineral. Of the two cleavages seen in the hand specimen one is more distinct than the other; both are more or less curved and much interrupted. Inclusions along the cleavage surfaces, probably due to alteration, of the same brownish yellow mineral, previously noted, are very common. No trace of the colourless mineral observed along the

parting planes was noted along the cleavages. That the mineral has been subjected to strain is demonstrated by the presence of minute faults beautifully shown by the colourless mineral along the parting planes; possibly the curved cleavage surfaces are further evidence of this.

Pleochroism is well-marked, and the change of colour from rose-red to purple at right angles to the cleavage when absorption is greatest makes a very beautiful slide. Parallel extinction was observed. Unfortunately, no optical figure could be obtained.

Very small angular fragments of quartz appear to be the only other inclusions present beside those already described associated with the cleavage and parting.

Although every care was taken to obtain pure material for chemical analysis, it is obvious from an examination of slides that it is impossible to ensure this result. However, the results of a partial analysis made by Mr. R. O. Chalmers are sufficient definitely to identify the mineral as purpurite, first described by Graton and Schaller[15]. Owing to the small amount of material available, water was determined by difference; its presence has been proved qualitatively. The presence of lithium was determined by spectroscopic methods.

Partial analysis of purpurite from Euriowie Range, New South Wales, by R. O. Chalmers.

Fe_2O_3	36·30
Mn_2O_3	15·30
P_2O_5	36·60
CaO	2·16
K_2O	2·26
Na_2O	1·60
SiO_2	0·20
H_2O (by difference)	5·30
Insoluble residue	0·28
	100·00

The excess of alkalies is probably due to the fact that the material was secured near the surface in a locality where weathering might be expected to produce such a result.

The molecular ratios of the principal constituents are as follows :—

Fe_2O_3	227	1·11
Mn_2O_3	097	
P_2O_5	258	0·88
H_2O	294	1·00

Considering the nature of the material analysed, this is a close approximation to the formula of purpurite 2 (Fe, Mn) PO_4 + H_2O.

[15] Graton, L. C., and Schaller, W. T.—Am. Journ. Sci., xx, 1905, pp. 146–151.

Bismutite.

Kingsgate, New South Wales.

The collection of the late W. H. Yates was recently presented to the Trustees by the members of his family.

In the collection are four specimens of bismutite which are of particular interest in that the bismutite is pseudomorphous after molybdenite. The original molybdenite has almost entirely disappeared, but its form has been more or less perfectly preserved. It consisted of hexagonal plates in quartz, so typical of the molybdenite found in the pipes of Kingsgate. The bismutite is a pale greenish-yellow colour and is associated with bismite and molybdite.

TWO NEW ASTEROIDS FROM AUSTRALIA.

By

ARTHUR A. LIVINGSTONE,

(Assistant Zoologist, The Australian Museum, Sydney.)

(Plate xviii.)

THIS contribution contains descriptions of two new species, one from New South Wales and one from Western Australia. The former belongs to the genus *Pseudarchaster*, which has not hitherto been recorded from Australian waters; the Western Australian species belongs to *Parasterina*, and has already in that State an ally, *P. crassa* (Gray).

The genus *Parasterina* is, so far, confined to the southern hemisphere, being recorded from South Africa, Australia, and South America.

Pseudarchaster boardmani sp. nov.

(Plate xviii, figures 7–11.)

Description.—Rays five; R. = 28 mm., r. = 11·5 mm., R. = 2·4 r. Breadth of ray between second and third superomarginal 10 mm. The rays are fairly short and tapering; narrow. Interbrachial arcs rounded, though slightly inclined to acuteness.

The abactinal surface is covered in paxillæ, which are compact but not wholly uniform in size. Some are small, carrying about eight granule-like spinelets, while others, particularly the regularly arranged median radial series, are much larger, carrying up to forty spinelets. The peripheral spines are slender, some almost needle-like in appearance. The paxillæ decrease in size on the rays and near the margins of the disc, but no groove of any kind exists between the paxillæ and the superomarginal plates. The abactinal plates, which carry, and are totally hidden by, the densely packed paxillæ, are roundly hexagonal, slightly domed, and surrounded by six papular pores as in species of *Mediaster*. The plates vary in size, some being very small, particularly on the rays. Only the median radial series reaches to the terminal plate. The series next to it ends at the fifth or sixth last superomarginal plate.

Counting from the middle of the interbrachial arc to the terminal plate the superomarginals are seen to be fifteen in number. Superomarginals in and near the middle of the interbrachial arcs are high and narrow, with deep sutures between them, but gradually become wider and lower and the sutures much shallower towards the ends of the rays. The ultimate superomarginal plate is very small. All the superomarginals are clothed in a spine-like granulation, which is very dense and evenly distributed. The terminal plate is fairly large and conspicuous, prismatic, and possesses a rugged surface and a glassy sheen. On the actinal surface the terminal plate is deeply channelled to accommodate an extension of the ambulacral groove.

The inferomarginal plates correspond in number, size, arrangement, and general character to the superomarginal plates. In both series of marginals the deep sutures occurring between plates in and near the centre of the interbrachial arcs are partially filled in by long slender spinelets, which spring from the inner walls of the plates and stand out at right angles.

The madreporite is small, hexagonal in outline, dome-like, and perforated by deep wavy channels.

The polygonal actinal intermediate plates are fairly prominent, dome-like, and separated by well-defined grooves. Many near the oral plates are provided with only a few short spinelets of varying thicknesses. In specimens older than the holotype over half the number of actinal intermediate plates are absolutely bare; the remaining plates carry short spines of varying thicknesses numbering up to twenty to each plate. The series lying next to the adambulacrals terminate between the fourth and fifth inferomarginal counting from the middle of the interbrachial arc.

The adambulacral plates are directed obliquely inwards and are joined to one another laterally by a yellowish, glistening, membranous integument. The furrow spines vary from five to eight to a comb, seven being the usual number. Near the mouth these furrow spines are short and stout; in the middle of the ray they are comparatively long and stout and of even width for their entire length, while near the ends of the rays they are fairly thin and short. On the actinal face of each adambulacral plate and behind the furrow series, are three irregular rows of short spines, which are slightly thinner than the spines of the furrow series, yet often quite as long.

The oral plates are elevated above the actinal intermediate plates and bear well-defined sutures. Eight marginal spines occur, the innermost two being flat sided and very much bigger than the remaining six. The outer half of the actinal surface of each oral plate is almost bare, being provided with only from four to five granules arranged in a row. The inner half is covered by short, stout, and untapered spinelets.

Localities.—Off Cape Everard. New South Wales, 75 fathoms; sea floor composed of sand and clay. Trawled and presented by Captain K. Moller, 1930. One specimen, the holotype (Austr. Museum Reg. No. J.5633).

Twenty-four miles N.N.E. of Montagu Island, New South Wales, 80 to 90 fathoms. Collected by W. Boardman, Sept., 1926, on trawler "Gunner." Three specimens. (Austr. Museum Reg. Nos. J.5035–37).

Colour in Life.—Superomarginals pale orange, except for about the last six on tip of ray, which are creamish-white. Centre of disc deep reddish-orange with five inter-radial bands of the same colour reaching out to the superomarginals. Remainder of abactinal surface pale orange. Actinal surface creamish-white.

Remarks.—The comparatively large size of the terminal plate, the swollen nature and large size of the superomarginals in distal half of the ray, the single row of abactinal plates reaching to tip of ray, the nature of the oral plates and the narrow rays, are characters which, when grouped together, serve to separate this species from its allies.

Parasterina troughtoni sp. nov.

(Plate xviii, figures 1–6.)

Description.—Rays five. R. = 16 mm., r. = 5·5 mm., br. (near base of ray) = 5 mm. R. = 2·9 r. and 3·2 br. The rays are fairly short and stout; each tapers imperceptibly to a blunt rounded extremity. The amount of tapering is so slight that measurement shows it to be less than ·75 mm.

The entire abactinal surface is paved with distinctly raised almost flat-topped plates, varying slightly in size but always roughly oval in outline except near and at the tips of the rays, where they are inclined to be circular. All abactinal plates are clothed in very minute spinelets, which are almost granule-like to the unaided eye. These spines are very numerous; about forty occur to each plate, including an extensive peripheral series. The abactinal plates show no tendency towards imbrication. On the tops of the rays the plates are arranged in regular longitudinal rows; a papular pore occurs between each plate. On the sides of the rays the plates run uninterruptedly in downwardly sloping series. In these areas the papular pores do not separate the plates; they occur sparingly only between the series or rows of plates, and are comparatively large in size.

The madreporite, which is very small, is situated near the centre of the disc.

The terminal plate is small but readily distinguishable; it is dome-like and oval in outline.

The actinal surface presents a thinly furred appearance owing to the masses of short, cylindrical spinelets, which spring from the regularly arranged plates. The actinal plates are very small and are almost entirely hidden by the spinelets which surmount them. About ten to twelve spinelets occur to each plate.

The furrow combs, which overlap one another in a slightly oblique manner, each contain from two to four stout spinelets. On the actinal face of each adambulacral plate and behind the furrow comb is a clump of from three to six spinelets, which are smaller than the furrow spines. Each oral plate carries about ten stout marginal spinelets. Behind these and on the actinal face of the plate, a fork of two or a line of four smaller spinelets are to be seen.

The general spinulation of the actinal surface reminds one of species of *Nepanthia*, as it merges and blends the various areas of spines so well that difficulty is experienced in securing lines of demarcation.

Locality.—Shore at Albany, King George's Sound, Western Australia. Collected by Messrs. Troughton, Grant, and Wright, November, 1921, one specimen, the holotype (Austr. Museum Reg. No. J.3978.).

Remarks.—*Parasterina troughtoni* sp. nov. is allied to *P. obesa* H. L. Clark. The differences are as follows:—In *P. troughtoni* the rays taper so slightly that measurement shows the amount to be less than ·75 mm. Up to four spinelets occur to each furrow comb. Spines behind the furrow series number from three to six. The oral plates carry a greater number of spines both on the margins and on the actinal faces.

P. troughtoni has been compared with specimens of *P. crassa* (Gray) from Western Australia and the following differences seen. In *P. troughtoni* the abactinal plates are comparatively large, no small intervening plates being present; the abactinal plates are spaced some small distance apart on the tops of the rays and are not closely packed. The papular pores are comparatively large and conspicuous. Up to four very small and short spinelets in each furrow comb. Oral plates and spines small, the latter fewer in number. Spines on the actinal intermediate plates, short, stout, comparatively uncrowded, not long, thin, crowded, and plentiful.

EXPLANATION OF PLATE XVIII.

Figure 1.—*Parasterina troughtoni* sp. nov. Portion of abactinal surface of ray of holotype. Enlarged.

Figure 2.—Same species. Actinal surface of holotype. Slightly enlarged.

Figure 3.—Same species. Abactinal surface of holotype. Slightly enlarged.

Figure 4.—Same species. Denuded tip of ray of holotype showing terminal plate. Enlarged.

Figure 5.—Same species. Denuded abactinal surface of ray of holotype. Enlarged.

Figure 6.—Same species. Centre of actinal surface of holotype showing mouth spines. Enlarged.

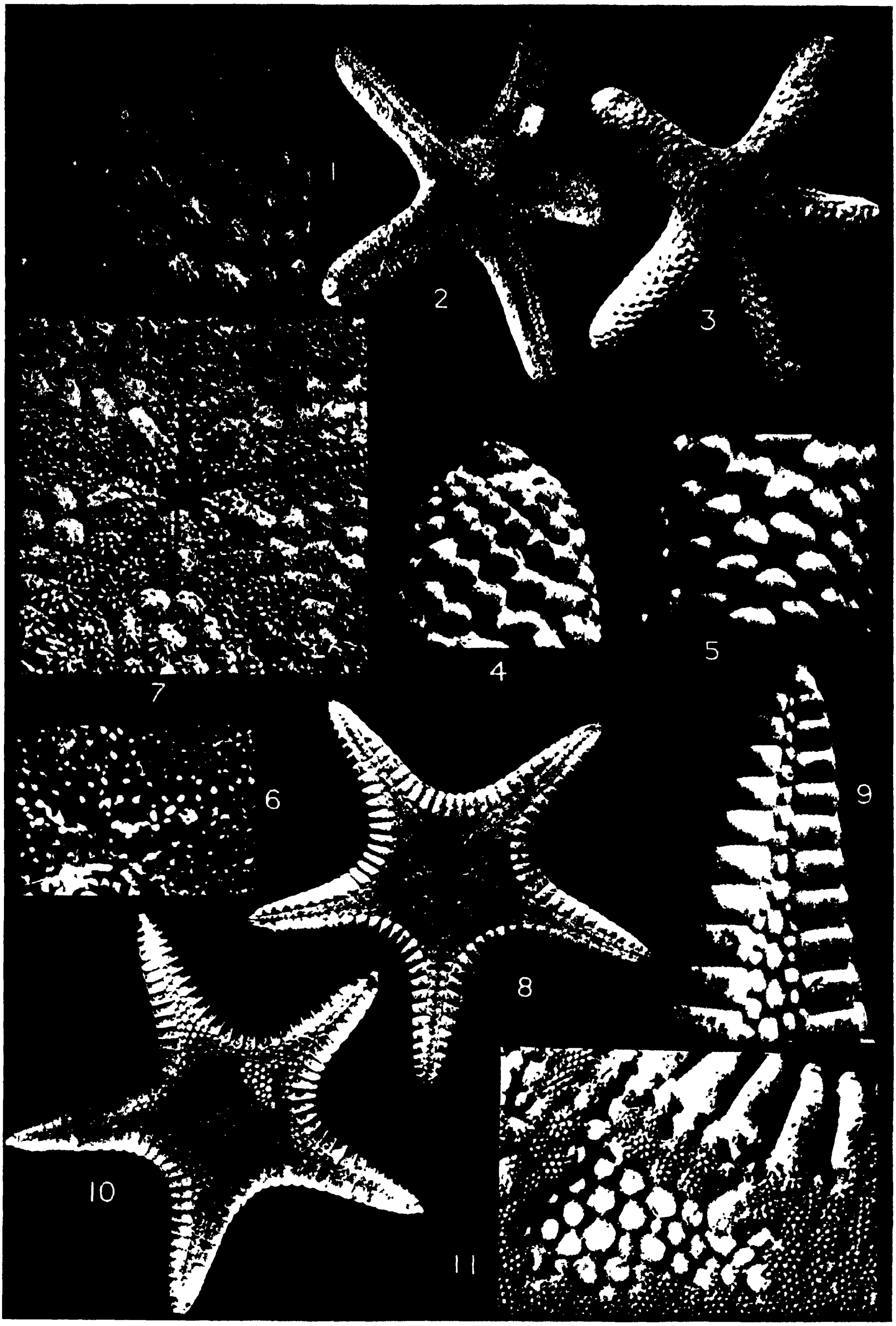
Figure 7.—*Pseudarchaster boardmani* sp. nov. Centre of actinal surface of holotype showing mouth spines. Enlarged.

Figure 8.—Same species. Actinal surface of holotype. About natural size.

Figure 9.—Same species. Denuded tip of ray of holotype. Enlarged.

Figure 10.—Same species. Abactinal surface of holotype. About natural size.

Figure 11.—Same species. Paxillæ removed from portion of the abactinal surface to show plates below and arrangement of the papular pores in the holotype. Enlarged.



G. C. CLUTTON, Photo.

* 36368

THE MITE *ORIBATA LAMELLATA* AND RELATED SPECIES.

By

ARTHUR PAUL JACOT.

(White Plains, New York, U.S.A.)

(Figures 1–6.)

In 1927 the Trustees of the Australian Museum kindly sent me four types of *Oribata lamellata* Rainbow[1] for study[2]. In 1929 I received the remaining specimens. Eight of the latter have been recorded[3], and I now proceed to report on the last specimens, which are *Udetaliodes funafutiensis* Jacot[4]. To summarise this investigation, the type material comprised *U. hawaiiensis wakensis* Jacot[5], nine specimens; *U. funafutiensis*, five specimens; *U. lamellatus*, two specimens. Theoretically I should have restricted the specimens of *U. h. wakensis* as types of *O. lamellatus*, but could not guess they were so abundant from the first lot received. The original description of the pseudostigmatic organs and the dimensions do not fit *U. h. wakensis*. Thus, the original description must have been based on the larger specimens, probably *U. funafutiensis.*

Udetaliodes funafutiensis Jacot.

1929. *Udetaliodes funafutiensis* Jacot, Trans. Amer. Micro. Soc., xlviii, 23 February, 1929, p. 38.

Diagnostic Characters.—Pseudostigmatic organs projecting well beyond pseudostigmata; rostrum crossed by two strongly developed transverse ribs; cephaloprothoracic pocks strong, crowded, distinctly grouped in two raised, clearly defined, widely separated groups; pseudostigmatic organ head without bristles (Figure 1); anterior rim of notogaster finely, strongly wrinkled, especially on ventral face (Figure 2); anterior area of notogaster sculptured by faint network which is coarser and more irregular dorso-mesially (Figure 2); genital covers (Figure 4) with regular, rather fine areolations on mesial half, lateral half coarsely, irregularly areolated, bristles 5/2 (which is probably the complete number for this genus); anal covers with more ribs than in *U. bataviensis* [6] due to a tendency to bifurcate (Figure 3).

Legs I (Figure 6) with bristles short, stout, ribbed, rapier-like. Ventral edge of tibiæ with straight bristles almost as long as height of segment; middle bristle of dorsal face of tibiæ stout, rapier-like. I find no evidence of a ventro-distal flange on femora I. Size (average), 0·94 x 1·48 mm.

Cotypes.—Five specimens under fallen damp leaves and sticks beneath bushes of *Pemphis acidula* (or Ngia) growing on a low breccia scarp on western side of the north arm of the mangrove swamp, Island of Funafuti, slides K2181 b and c.

[1] Rainbow.—Australian Museum Memoir III, 25 February, 1897, pp. 105 and 109, pl. ii, fig. 3.
[2] Jacot.—Transactions American Micro. Soc., xlviii, 23 February, 1929, p. 36.
[3] Jacot.—Bernice Pauahi Bishop Museum Bulletin 121, 7 April, 1934.
[4] Jacot.—*Loc. cit.*, 1929, p. 38.
[5] Jacot.—*Loc. cit.*, 1934, pl. xvi.
[6] Jacot.—*Loc. cit.*, 1929, pl. vii, fig. 13.

THE FOOD OF TROUT IN NEW SOUTH WALES. 1933–1934.

By Keith C. McKeown

(Assistant Entomologist, the Australian Museum).

This paper contains the results of the investigation into the food of trout in New South Wales carried out during the season 1933–1934, and gives details of the stomach contents of 118 Rainbow Trout (*Salmo irideus* Gibbons), 27 Brown Trout (*Salmo fario* Linnæus), and 2 Loch Leven Trout (*Salmo levenensis* Walker).

A preliminary report[1] published in 1934 covered the results of the work carried out in 1931-1933. This investigation aroused so much interest among anglers and those concerned in the propagation of trout in our streams that the work was carried on throughout the past season, members of the Rod Fishers' Society of New South Wales kindly submitting collections of trout stomachs from time to time.

A notable feature of the stomachs examined was the large number of caddis cases found, which numbered 6,648 from 146 fish as against 188 in 1931-1933 from 44 fish. These figures conform very closely to those which have been obtained in New Zealand.

Dragonflies and their nymphs were found to be considerably in excess of those found in the previous season's work; 475 in 146 fish as against 56 in 44 fish. One fish contained no less than 256 adult Zygopterid dragonflies. The proportion of aquatic to terrestrial insects is practically reversed, the terrestrial species being in very much smaller numbers this season; a condition due, possibly, to the extremely wet season experienced throughout the State, which would tend to render the terrestrial species less available, and force the fish to feed more upon the aquatic forms.

One small Cat-fish obtained from a Rainbow Trout is of interest in view of the contention that the trout feed upon fry.

The opinion was freely expressed in some quarters that the Brown Trout feeds more upon the surface of the water than does the Rainbow. A comparison of the averages of the various Orders of animals eaten shows that there is little in the figures available to support the contention, whatever may be disclosed when larger

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[1] McKeown.—Notes on the Food of Trout and Macquarie Perch in New South Wales. Rec. Aust. Mus. xix, 2, 1934, pp. 141–152, pl. xvii.

numbers are available. The figures showing the comparison of the averages per fish for each food for Brown and Rainbow Trout are as follows :—

	Aquatic.		Non-Aquatic.	
	Brown.	Rainbow.	Brown.	Rainbow.
Coleoptera	·36	·52	4·7	2·18
Hemiptera	1·5	·21	·23	·46
Hymenoptera	...	...	4·0	5·7
Orthoptera	...	...	·85	3·1
Trichoptera	29·7	37·6	...	...
Lepidoptera	...	...	·45	·21
Odonata	4·3	2·8	...	...
Ephemeroptera	·27	·93	...	...
Diptera	...	·02	·9	·52
Neuroptera	...	...	...	·18
Thysanoptera	...	...	...	·03
•Perlaria	...	·04	...	...
Araneidæ	...	...	·3	·13
Crustacea	·42	·47	...	...
Mollusca	·72	1·21	...	...
	37·27	43·8	11·43	12·51

Includes figures from previous paper.

Members of the Rod Fishers' Society of New South Wales have stressed the desirability of tabulating the various foods taken by the fish for each month of the season. Tables setting out the monthly distribution of food of Rainbow and Brown Trout for each locality are therefore appended :—

Monthly Comparison of Stomach Contents of Rainbow Trout
(*Salmo irideus* Gibbons).

	November.						December.					
	Goodradigbee.	Badja.	Tuross.	Upper Murrumbidgee.	Barrington.	Little Manning.	Goodradigbee.	Badja.	Tuross.	Upper Murrumbidgee.	Barrington.	Little Manning.
Stomachs exd.	13	8	3		24				1	4		
Coleoptera	115	8	24		51				...	34		
Hemiptera	45	5	1		6				...	2		
Hymenoptera	42	...	...		13				...	9		
Neuroptera	15	...	...		1				...	...		
Orthoptera	3	1	...		...				...	1		
Trichoptera	111	1,128	95		68				...	1,259		
Lepidoptera	4	...	5		8				...	1		
Odonata	3	10	14		34				...	1		
Ephemeroptera	*	6	2		11				...	62		
Diptera	5	6	1	No data.	52	No data.	No data.	No data.	...	1	No data.	No data.
Thysanoptera	...	...	...		4				...	...		
Perlaria	3	...	...		4				...	...		
Miscellaneous Insects	*	*	*		*				...	...		
Araneidæ	5	1	1		1				...	...		
Vermes	1	1	...		1				...	...		
Mollusca	...	114	...		...				...	...		
Myriapoda	...	...	...		...				...	...		
Amphibia	...	1	...		1				...	...		
Pisces	...	...	...		...				...	...		
Crustacea	2	1	2		17				1	...		

Table covers perion 1931-1934. * Indicates presence.

Monthly Comparison of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

	January.						February.					
	Goodradigbee.	Badja.	Tuross.	Upper Murrumbidgee.	Barrington.	Little Manning.	Goodradigbee.	Badja.	Tuross.	Upper Murrumbidgee.	Barrington.	Little Manning.
Stomachs exd.	12		8						13			21
Coleoptera	66		58						51			15
Hemiptera	18		11						1			6
Hymenoptera	33		3						5			9
Neuroptera	11		...						...			...
Orthoptera	2		1						3			76
Trichoptera	10		1,825						394			409
Lepidoptera	3		9						2			1
Odonata	9		31						376			14
Ephemeroptera	2		4						...			1
Diptera	2	No data.	1	No data.	No data.	No data.	No data.	No eata.	...	No data.	No data.	2
Thysanoptera	...		...						...			...
Perlaria	...		...						...			...
Miscellaneous Insects	...		*						*			*
Araneidæ	3		1						...			3
Vermes	...		...						...			4
Mollusca	...		42						...			...
Myriapoda	...		...						...			1
Amphibia	...		...						...			1
Pisces	...		...						...			1
Crustacea	...		...						...			3

	March.						April.					
	Goodradigbee.	Badja.	Tuross.	Upper Murrumbidgee.	Barrington.	Little Manning.	Goodradigbee.	Badja.	Tuross.	Upper Murrumbidgee.	Barrington.	Little Manning.
Stomachs exd.		28						19	3			
Coleoptera		4						19	20			
Hemiptera		8						10	7			
Hymenoptera		20						355	407			
Neuroptera		1						...	...			
Orthoptera		2						394	2			
Trichoptera		318						113	35			
Lepidoptera		...						...	1			
Odonata		23						16	22			
Ephemeroptera		26						27	5			
Diptera	No data.	4	No data.	No data.	No data.	No data.	No data.	4	12	No data.	No data.	No data.
Thysanoptera		...						1	...			
Perlaria		...						...	...			
Miscellaneous Insects		*						*	*			
Araneidæ		2						3	1			
Vermes		1						1	3			
Mollusca		1						33	...			
Myriapoda		...						...	...			
Amphibia		...						...	...			
Pisces		...						...	...			
Crustacea		2						42	...			

Table covers period 1931–1934. * Indicates presence.

Monthly Comparison of Stomach Contents of Brown Trout
(*Salmo fario* Linnæus).

	November.		December.		January.		February.	
	Tuross.	Upper Murrumbidgee.	Tuross.	Upper Murrumbidgee.	Tuross.	Upper Murrumbidgee.	Tuross.	Upper Murrumbidgee.
Stomachs exd. ...	6		1	9	14		3	
Coleoptera	33		1	68	42		17	
Hemiptera	3		...	5	50		2	
Hymenoptera ...	2		...	9	109		1	
Orthoptera	2		...	12	13		1	
Trichoptera	325		7	31	605		2	
Lepidoptera	8		1	5	1		...	
Odonata	11	No data.	6	16	76	No data.	7	No data.
Ephemeroptera ...	3		2	1	3		...	
Diptera	1		...	2	18		...	
Mecoptera	...		...	1	...		...	
Misc. Insects	*		*	*	*		...	
Araneidæ	...		...	2	8		1	
Vermes..............	1		...	...	10		...	
Mollusca	...		...	...	24		...	
Mammalia	...		...	...	1		...	
Crustacea............	4		5	...	5		...	

Table covers period 1933-1934. * Indicates presence.

The following notes on river conditions will prove of value in studying the trout food from each locality.

Big Badja River.

Note by Mr. A. C. Ebsworth, 6th April, 1934.—"When we arrived the river was in partial flood, and as there had been a lot of rain (we have hardly had three fine days in succession) it has remained above normal level. The fish have been rising very little, and those caught have mostly been with a sunk fly, owing, I suppose, to the fact of there being plenty of food in the water brought down by the various floods. These conditions may have some bearing on the contents of the stomachs."

Tuross River.

Conditions in the Tuross River have been abnormal, repeated floods having washed the river out clean. The first of this series of floods was on 7th January, 1934; two further floods followed at close intervals.

Barrington River.

Note by Dr. L. May, 11th December, 1933.—"The fish were caught on wet and dry fly in various waters. Some were from pools on a gently running section of the Barrington River, others from a very rocky series of rapids known as Sandy Flat, and others from the area near the fenced area near Edwards' original property, where the stream runs through a marshy swamp and where three small brooks unite."

Little Manning River.

Note by Mr. G. H. Montgomery, 25th February, 1934.—"During my fortnight's visit to the Barrington Tops district (which, by the way, was considerably further north than the Barrington River, the route we took being by Scone, and then east, 70 miles approximately), we had only two fine days, the remaining eleven days being very wet, the streams coming down bankers on two occasions, bringing millions of grasshoppers and other food for the trout, and not once during our visit did the trout rise except to an odd grasshopper floating down, ... there was never a general rise at any time. In the jar are half a dozen stomachs from the Dilgry. This creek was visited by me for investigation, and in order to get some stomachs for you, particularly as I think the contents will be more varied, the struggle for existence there being much greater than in other streams. It is a very small stream where I was, and there were thousands of small trout there, from three to ten inches long, mostly of the smaller size, and all in roe, showing that in a stream with plenty of food these would be probably, for their age, four times as long and proportionately heavy. The stream must be a natural hatchery, and free from any eels.

You will notice how small the stomachs are from these fish. The Dilgry is in the Parish of Milli, County of Gloucester, about 4 miles or so (at the point I visited) from the Gummi or Little Manning River about 8 or 9 miles from Tomalla Homestead, being 3 miles south-east of Tomalla Public Telephone Office."

I am indebted to Dr. A. J. Spiller Brandon, Dr. L. May, Messrs. A. C. Ebsworth and G. H. Montgomery, and Rev. W. A. Evans for considerable trouble taken by them in collecting the stomachs for examination and for much valuable information, and to members of the Rod Fishers' Society for assistance they have always readily given me.

Stomach Contents of Rainbow Trout.

(*Salmo irideus* Gibbons.)

Big Badja River.

No. 1.— ♀, 1½ lb.; 3 p.m., 6 November, 1933. Collected by Mr. A. C. Ebsworth. Coleoptera: 1 Scarabæid beetle (*Heteronyx* sp.). Hemiptera: 2 immature Corixids. Trichoptera: 265 Caddis cases. Odonata: 1 Zygopterid dragonfly (? gen. et sp.). Ephemeroptera: 3 Mayflies, 2 nymphs, and remains of many other imagines. Diptera: 1 Asilid fly (*Neoaratus inglorious*), 5 flies (? gen. et sp.). Miscellaneous insects: A quantity of finely broken insect remains. Mollusca: 4 *Bullinus* sp. Amphibia: 1 small frog.

No. 2.— ♀, 2 lb.; 6 p.m., 6 November, 1933. Collected by Mr. A. C. Ebsworth. Trichoptera: 9 Caddis cases. Vermes: 1 Gordian worm. Mollusca: 47 *Bullinus* sp., and 2 *Planorbis* sp. Miscellaneous: Large quantity of sand and gravel.

No. 3.— ♀, 1½ lb.; 4 p.m., 6 November, 1933. Collected by Mr. A. C. Ebsworth. Trichoptera: 16 Caddis cases. Mollusca: 60 *Bullinus* sp.

No. 4.— ♂, 1¼ lb.; 5 p.m., 6 November, 1933. Collected by Mr. A. C. Ebsworth.— Coleoptera: 1 beetle (? gen. et sp.). Hemiptera: 2 *Corixa* sp. (immature). Trichoptera: 18 Caddis cases. Odonata: 1 Zygopterid dragonfly nymph. Crustacea: 1 shrimp (*Paratya australiensis*).

No. 5.— ♂, 2¼ lb.; 4·30 p.m., 9 November, 1933. Collected by Mr. A. C. Ebsworth—Coleoptera: 1 Soldier beetle (*Telephorus* sp.). Hemiptera: 1 *Corixa* sp. Trichoptera: 156 Caddis cases, 2 mature caddis-flies and remains of many others. Odonata: 2 Anisopterid dragonfly nymphs. Araneidæ: 1 spider (*Tetragnatha* sp.).

No. 6.— ♂; 6·30 p.m., 10 November, 1933. Collected by Mr. A. C. Ebsworth.—Trichoptera: 69 Caddis cases, 7 adult caddis-flies together with a large quantity of wings and remains. Odonata: 1 Zygopterid dragonfly nymph. Mollusca: 1 mollusc without shell. Miscellaneous: Portion of water plant with root.

No. 7.— ♀, 2 lb.; 11·30 a.m., 10 November, 1933. Collected by Mr. A. C. Ebsworth.—Coleoptera: 5 small water beetles. Orthoptera: 1 immature grasshopper. Trichoptera: 525 Caddis cases. Odonata: 4 Zygopterid dragonfly nymphs. Ephemeroptera: 1 Mayfly nymph.

No. 8.—? sex, 2¼ lb.; 4·30 p.m., 10 November, 1933. Collected by Mr. A. C. Ebsworth.—Coleoptera: 1 Soldier beetle (*Telephorus* sp.). Trichoptera: 21 Caddis cases. Odonata: 1 Zygopterid dragonfly nymph.

No. 8a.— ♀, 1¾ lb.; 10 March, 1934. Collected by Rev. W. A. Evans.—Hemiptera: 1 *Corixa* sp. Trichoptera: 27 Caddis cases. Odonata: 2 Zygopterid dragonflies. Ephemeroptera: 4 Mayflies.

No. 9.— ♀, 3½ lb.; 6 p.m., 20 March, 1934. Collected by Mr. A. C. Ebsworth.—Hemiptera: 1 *Corixa* sp. Trichoptera: 6 Caddis cases. Ephemeroptera: Wings of Mayflies. Miscellaneous insects: A quantity of insect remains. Crustacea: 4 shrimps (*Paratya australiensis*).

No. 10— ♀, 1½ lb.; noon, 20 March, 1934. Collected by Mr. A. C. Ebsworth.—Trichoptera: 5 Caddis cases. Odonata: 1 Zygopterid dragonfly (imago). Miscellaneous: Quantity of vegetable remains.

No. 11.— ♀, ¾ lb.; 6·40 p.m., 20 March, 1934. Collected by Mr. A. C. Ebsworth.—Coleoptera: 1 Hydrophyllid larva, triturated remains of a beetle. Odonata: 1 Anisopterid nymph.

No. 12.— ♀, 3¾ lb.; 7 p.m., 22 March, 1934. Collected by Mr. Cecil Stewart.—Coleoptera: Unidentifiable remains of beetle. Trichoptera: 2 Caddis cases. Crustacea: 1 Yabbie claw (*Parachæraps bicarinatus*).

No. 13.— ♀, ¾ lb.; 6 p.m., 22 March, 1934. Collected by Mr. A. C. Ebsworth.—Hymenoptera: 1 ant (*Camponotus* sp.). Trichoptera: 6 Caddis cases. Ephemeroptera: 7 Mayflies and a quantity of remains. Araneidæ: 1 spider (*Salticidæ*).

No. 14.— ♀, ¾ lb.; 5·30 p.m., 25 March, 1934. Collected by Mr. A. C. Ebsworth.—Trichoptera: 4 Caddis cases.

No. 15.— ♀, ¾ lb.; noon, 26 March, 1934. Collected by Mr. A. E. Morgan.—Trichoptera: 6 Caddis cases. Odonata: 1 Anisopterid nymph. Ephemeroptera: 1 Mayfly.

No. 16.— ♀, 1 lb.; 1 p.m., 26 March, 1934. Collected by Mr. A. E. Morgan.—Trichoptera: 10 Caddis cases. Odonata: 1 Anisopterid dragonfly nymph, and 1 Zygopterid dragonfly imago (? gen. et sp.).

No. 17.— ♀, 1¼ lb.; 2 p.m., 26 March, 1934. Collected by Mr. A. E. Morgan.—Trichoptera: 2 Caddis cases. Odonata: 1 Anisopterid nymph.

No. 18.— ♀, 1 lb.; 12·30 p.m., 26 March, 1934. Collected by Mr. A. E. Morgan.—Hymenoptera: 5 Winged ants (*Myrmecia* sp.), 2 Ichneumon wasps (? gen. et sp.). Orthoptera: 1 grasshopper (immature). Diptera: 2 Stratiomyid flies (*Boreoides* sp.). Miscellaneous insects: Quantity of triturated insect remains.

No. 19.— ♀, 1 lb.; 1 p.m., 28 March, 1934. Collected by Mr. A. E. Morgan.—Trichoptera: 1 Caddis case. Odonata: 1 Anisopterid nymph. Diptera: 7 *Bibio* sp.

No. 20.— ♀, 1 lb.; 3·30 p.m., 28 March, 1934. Collected by Mr. A. C. Ebsworth.—Trichoptera: 18 Caddis cases. Ephemeroptera: 6 Mayflies. Miscellaneous: A few leaves.

No. 21.—? sex, 1 lb.; 11·30 a.m., 28 March, 1934. Collected by Mr. A. E. Morgan.—Trichoptera: 73 Caddis cases. Odonata: 1 Anisopterid nymph. Diptera: 1 fly (*Rutilia regalis*). Mollusca: 1 *Planorbus* sp. Miscellaneous: 1 feather.

No. 22.—? sex, 1 lb.; noon, 28 March, 1934. Collected by Mr. A. C. Ebsworth.—Coleoptera: 1 Scarabæid beetle (*Phyllotocus navicularis*). Hemiptera: 8 Water-striders (*Gerris* sp.). Hymenoptera: 1 winged ant (? gen. et sp.). Trichoptera: 30 Caddis cases. Ephemeroptera: 8 Mayflies.

No. 23.— ♀, 1 lb.; noon, 28 March, 1934. Collected by Mr. A. E. Morgan.—Trichoptera: 2 Caddis cases. Miscellaneous insects: A small quantity of insect remains. Miscellaneous: Unidentifiable vegetable matter.

No. 24.— ♀, 1 lb.; 11·30 a.m., 28 March, 1934. Collected by Mr. A. C. Ebsworth.—Hemiptera: 1 Water-strider (*Gerris* sp.). Hymenoptera: 1 bee (? gen. et sp.). Trichoptera: 4 Caddis cases. Odonata: 1 Anisopterid dragonfly nymph.

No. 25.— ♂, 1¼ lb.; 1·30 p.m., 28 March, 1934. Collected by Mr. A. C. Ebsworth.—Hemiptera: 2 *Gerris* sp. Araneidæ: 1 Huntsman spider (*Isopeda* sp.).

No. 26.— ♀, ¾ lb.; 4·45 p.m., 29 March, 1934. Collected by Mr. A. E. Morgan.—Coleoptera: 1 small Hydrophyllid beetle. Hemiptera: Remains of *Gerris* sp.

No. 27.— ♀, 1¼ lb.; 1·30 p.m., 29 March, 1934. Collected by Mr. A. C. Ebsworth.—Hymenoptera: Head of bee (*Apis mellifica*), 1 winged ant (*Myrmecia*) ♂, 1 ant (*Camponotus nigriceps*). Trichoptera: 1 Caddis case. Odonata: 1 Anisopterid dragonfly nymph. Miscellaneous insects: Small quantity of broken insect remains. Crustacea: 1 shrimp (*Paratya australiensis*).

No. 28.— ♀, 3¼ lb.; 3·30 p.m., 30 March, 1934. Collected by Mr. Cecil Stewart.—Hemiptera: 1 *Corixa* sp. Hymenoptera: 1 bee (? gen. et sp.), 1 ant (*Myrmecia* sp.). Trichoptera: 5 Caddis cases. Odonata: 1 Anisopterid dragonfly nymph. Miscellaneous insects: Quantity of broken and unidentifiable insect remains.

No. 29.— ♀, 1 lb.; 1·30 p.m., 30 March, 1934. Collected by Mr. Cecil Stewart.—Hemiptera: 1 *Corixa* sp. Trichoptera: 97 Caddis cases.

No. 30.— ♀, ¾ lb.; 1 p.m., 30 March, 1934. Collected by Mr. Reuben Stewart.—Coleoptera: 1 weevil (*Belus* sp.). Hymenoptera: 1 winged ant ♂ (*Myrmecia* sp.). Neuroptera: 1 Lacewing (*Chrysopa* sp.). Diptera: 1 fly (*Boreoides subulatus*—Fam. Stratiomyidæ) ♀. Miscellaneous insects: Small quantity of finely divided insect remains.

No. 31.— ♀, 1 lb.; 2·30 p.m., 30 March, 1934. Collected by Mr. Cecil Stewart.—Hymenoptera: 1 winged ant ♂ (*Myrmecia gulosa*). Trichoptera: 2 Caddis cases. Orthoptera: 1 grasshopper (*Goniæa australasiæ*) immature. Odonata: 2 Anisopterid nymphs.

No. 32.— ♀, 3 lb.; Pound Creek (tributary of Big Badja River), noon, 30 March, 1934. Collected by Mr. A. E. Morgan.—Hymenoptera: 1 worker ant (*Myrmecia gulosa*) and ♂, 1 winged ant (? gen. et sp.). Trichoptera: 4 Caddis cases. Odonata: Wing of Zygopterid dragonfly. Vermes: 1 Gordian worm.

No. 33.— ♂, 1 lb.; 3·30 p.m., 31 March, 1934. Collected by Mr. S. Stewart.—Trichoptera: 1 Caddis case. Odonata: 7 Anisopterid nymphs. Miscellaneous: 1 large feather.

No. 34.— ♀, 1½ lb.; 3·30 p.m., 31 March, 1934. Collected by Mr. A. C. Ebsworth.—Hymenoptera: 1 Hive bee (*Apis mellifica*). Trichoptera: 4 Caddis cases.

No. 35.— ♂, ½ lb.; 4 p.m., 31 March, 1934. Collected by Mr. Reuben Stewart.—Trichoptera: 4 Caddis cases. Odonata: 1 Anisopterid nymph. Miscellaneous: A quantity of sand and gravel.

No. 36.— ♂, ¾ lb.; 3 p.m., 1 April, 1934. Collected by Mr. Cecil Stewart.—Hymenoptera: 12 winged ants (? spp.), 1 ant (*Iridomyrmex rufoniger*).

No. 37.— ♂, ¾ lb.; 3 p.m., 1 April, 1934. Collected by Mr. A. C. Ebsworth.—Trichoptera: 8 Caddis cases. Odonata: 1 Anisopterid nymph. Ephemeroptera: 1 Mayfly.

No. 38.— ♀, ½ lb.; 3·30 p.m., 1 April, 1934. Collected by Mr. A. C. Ebsworth.—Trichoptera: 5 Caddis cases. Odonata: 1 Anisopterid nymph.

No. 39.— ♀, ½ lb.; 4 p.m., 1 April, 1934.—Collected by Mr. A. C. Ebsworth.—Trichoptera: 13 Caddis cases.

No 40.— ♂, ¾ lb.; 1 p.m., 2 April, 1934. Collected by Mr. Reuben Stewart.—Hymenoptera: 118 winged ants (various spp., mainly *Iridomyrmex*), 1 winged ant ♂ (*Myrmecia gulosa*), and a large quantity of remains of ants. Trichoptera: 3 Caddis cases. Ephemeroptera: 3 Mayflies. Vermes: 1 Gordian worm.

No. 41.— ♂, 2½ lb.; 4·45 p.m., 3 April, 1934. Collected by Mr. A. C. Ebsworth.—Hymenoptera: 10 winged ants including *Myrmecia*, 1 bee (? gen. et sp.). Trichoptera: 2 Caddis cases. Odonata: 1 Anisopterid nymph.

No. 42.— ♂, ¾ lb.; 2 p.m., 2 April, 1934. Collected by Mr. Reuben Stewart.—Trichoptera: 1 Caddis case. Crustacea: 1 shrimp (*Paratya australiensis*). Miscellaneous: 2 leaves.

No. 43.— ♀, 1 lb.; 6 p.m., 5 April, 1934. Collected by Mr. Cecil Stewart.—Hemiptera: 1 *Gerris* sp. Trichoptera: 67 Caddis cases. Odonata: 1 Anisopterid nymph. Ephemeroptera: 23 Mayflies. Diptera: Remains of Mycetophyllid midges. Miscellaneous insects: Quantity of insect remains.

No. 44.— ♀, 1 lb.; 12·30 p.m., ? date, 1934. Collected by Mr. A. E. Morgan.—Coleoptera: 1 large beetle (? *Tenebrionidæ*). Crustacea: 1 shrimp (*Paratya australiensis*). Mollusca: 7 *Bullinus* sp.

Tuross River.

No. 45.— ♀, 1¼ lb.; 4 p.m., 5 November, 1933. Collected by Dr. S. Brandon.—Wet Fly: Claret and Mackerel. Coleoptera: 1 Cistelid beetle (? gen. et sp.), 2 Elaterid beetles (? spp.), 1 Scarabæid beetle (*Heteronyx* sp.). Trichoptera: 7 Caddis cases. Lepidoptera: 1 Lepidopterous larva. Odonata: 1 Anisopterid dragonfly nymph. Diptera: 1 Crane fly (Tipulidæ), and other dipterous remains. Araneidæ: 1 spider (*Epeira* sp.). Crustacea: 2 shrimps (*Paratya australiensis*).

No. 46.— ♀, 2 lb.; 10 a.m., 6 November, 1933. Collected by Dr. S. Brandon.—Fly: Pennell Hackle. Trichoptera: 43 Caddis cases. Lepidoptera: 1 lepidopterous larva. Odonata: 1 Zygopterid dragonfly nymph. Ephemeroptera: 2 Mayfly nymphs.

No. 47.— ♀, ½ lb.; 3 p.m., 7 November, 1933. Collected by Dr. S. Brandon.—Fly: Hare's Ear. Coleoptera: 20 Scarabæid beetles (*Heteronyx* sp.). Hemiptera: 1 *Corixa* sp. Trichoptera: 45 Caddis cases. Lepidoptera: 3 lepidopterous larvæ. Odonata: 9 Zygopterid dragonflies and 3 nymphs. Miscellaneous insects: A small quantity of unidentifiable insect fragments. Miscellaneous: A very large quantity of fibrous vegetable matter.

No. 48.— ♂, 1¼ lb.; 31 December, 1933. Collected by Rev. W. A. Evans.—Crustacea: 1 shrimp (*Paratya australiensis*).

No. 49.— ♀, 1½ lb.; 4 January, 1934. Collected by Dr. S. Brandon.—Coleoptera: 1 Scarabæid beetle (*Heteronyx* sp.). Hemiptera: 2 *Corixa* sp. Trichoptera: 53 Caddis cases. Odonata: 16 Zygopterid dragonfly nymphs and 2 imagines. Ephemeroptera: 1 Mayfly. Miscellaneous insects: Quantity of insect remains.

No. 50.— ♀, 4 January, 1934. Collected by Dr. S. Brandon.—Trichoptera: 45 Caddis cases. Crustacea: 1 Yabbie claw (*Parachæraps bicarinatus*).

No. 51.— ♀, 1¼ lb.; 11 a.m., 5 January, 1934. Collected by Dr. S. Brandon.—Coleoptera: 1 Scarabæid beetle (*Heteronyx* sp.). Trichoptera: 682 Caddis cases. Odonata: 9 Zygopterid dragonfly nymphs and 1 imago. Ephemeroptera: 1 Mayfly. Diptera: 1 large Asilid fly. Miscellaneous insects: A small quantity of broken insect remains. Miscellaneous: Vegetable matter.

No. 52.— ♀, 1 lb.; 11 a.m., 16 January, 1934. Collected by Dr. S. Brandon.—Coleoptera: 6 large and 9 small Scarabæid beetles (*Heteronyx* spp.) together with a large quantity of broken remains. Trichoptera: 94 Caddis cases. Ephemeroptera: 1 Mayfly nymph.

No. 53.— ♀, 1½ lb.; 21 January, 1934. Collected by Rev. W. A. Evans.—Coleoptera: Wing cases of Tenebrionid beetle. Hemiptera: 9 *Corixa* sp. Trichoptera: 430 caddis cases. Odonata: 2 Zygopterid dragonflies (imagines) and 1 Anisopterid nymph. Ephemeroptera: 1 Mayfly. Miscellaneous insects: Quantity of finely divided insect remains.

No. 54.— ? sex; January, 1934. Collected by Dr. S. Brandon.—Coleoptera: 12 Scarabæid beetles (*Heteronyx* sp.). Hymenoptera: Stomach crammed to capacity with triturated remains of ants, ¼ oz. in weight. Orthoptera: 1 Cockroach (*Panesthia granicollis*). Lepidoptera: 9 Lepidopterous larvæ. Araneidæ: 1 spider (*Epeira* sp.).

No. 55.— ? sex; January, 1934. Collected by Dr. S. Brandon.—Trichoptera: 520 Caddis cases. Mollusca: 42 *Bullinus* sp.

No. 56.— ? sex; January, 1934. Collected by Dr. S. Brandon.—Coleoptera: 1 *Diphucephala* sp., 22 *Phyllotocus navicularis*, 2 *Heteronyx* sp., 1 Carab beetle (*Clivinia* sp.), 1 Ladybird beetle (*Leis conformis*), 1 *Anoplognathus* sp. Hymenoptera: 3 bees (? gen. et spp.). Trichoptera: 1 Caddis case. Miscellaneous insects: A large quantity of unidentifiable insect remains.

No. 57.— ? sex; $1\frac{1}{2}$ lb.; 3 p.m. 4th February, 1934. Collected by Dr. S. Brandon. Fly: Bredbo.—Coleoptera: 1 *Phyllotocus* sp., 1 Carab beetle (*Clivinia* sp.). Hymenoptera: 2 winged ants ♂ (*Myrmecia gulosa*). Trichoptera: 12 Caddis cases. Odonata: 5 Zygopterid dragonflies. Diptera: 1 *Lucilia* sp. Miscellaneous: Quantity of vegetable matter.

No. 58.— ♀, 1 lb.; Little Back River; 3.15 p.m. 7th February, 1934. Collected by Dr. S. Brandon. Fly: Hopper Hackle.—Coleoptera: 16 Scarabæid beetles (*Heteronyx* sp.), 2 Tenebrionid beetles (? gen. et sp.). Hymenoptera: 1 worker ant (*Myrmecia gulosa*). Orthoptera: 1 grasshopper (immature). Trichoptera: 1 Caddis case. Miscellaneous insects: Quantity of broken remains.

No. 59 — ♀, 1 lb.; Little Back River; 2 p.m. 7 February, 1934. Collected by Dr. S. Brandon. Fly: Hopper Hackle.—Coleoptera: 2 *Heteronyx* sp., 1 Longicorn beetle (*Phoracantha* sp.), 1 Carab beetle (*Clivinia* sp.). Hymenoptera: 1 bee (? gen. et sp.). Orthoptera: 1 grasshopper (immature). Trichoptera: 1 Caddis case. Odonata: 1 Zygopterid dragonfly. Miscellaneous insects: Quantity of unidentifiable insect remains.

No. 60.— ♀, $1\frac{3}{4}$ lb.; Little Back River; 4.30 p.m. 7 February, 1934. Collected by Dr. Brandon. Fly: Hopper Hackle.—Coleoptera: 1 *Paropsis* sp., 6 *Heteronyx* spp., 1 Tenebrionid beetle (? gen. et sp.), 3 Halticidæ, 1 *Platypus* sp. Hymenoptera: 1 ant (? gen. et sp.), 1 Thynnid wasp ♀. Orthoptera: 1 grasshopper (immature). Trichoptera: 9 Caddis cases. Lepidoptera: 1 Lepidopterous larva.

No. 61.— ♀, $\frac{3}{4}$ lb.; Little Back River; 4 p.m. 7 February, 1934. Collected by Dr. S. Brandon. Fly: Bredbo.—Coleoptera: Quantity of broken remains of beetles, mainly *Heteronyx*. Hemiptera: 1 jassid. Trichoptera: 2 Caddis cases. Lepidoptera: 1 large Lepidopterous larva.

No. 62.— ♀, 2 lb.; 8 a.m. 10 February, 1934. Collected by Dr. S. Brandon. Fly: Tarana.—Coleoptera: 3 *Heteronyx* sp., 1 Cistelid beetle (? gen. et sp.), 1 Carab beetle (? gen. et sp.). Odonata: 256 Zygopterid dragonflies (imagines), and stomach crammed to capacity with remains.

No. 63.— ♀, 1 lb.; 12.30 p.m. 10 February, 1934. Collected by Dr. S. Brandon. Fly: Black Hackle.—Coleoptera: 1 Scarabæid beetle (*Heteronyx* sp.), 1 Carab beetle (? gen. et sp.), 1 Longicorn beetle (*Distichocera* sp.). Trichoptera: 332 Caddis cases. Odonata: 1 Zygopterid dragonfly.

No. 64.— ♀, 1¾ lb.; 7.15 p.m. 12 February, 1934. Collected by Dr. S. Brandon. Fly: Tarana. NOTE.—Completely empty, the upper stomach being practically a solid fleshy mass; lower stomach also empty.

No. 65.— ♀, 1¼ lb.; 5 p.m. 14 February, 1934. Collected by Dr. S. Brandon. Fly: Tarana.—Trichoptera 9 Caddis cases. Odonata: Stomach crammed with fragments of Zygopterid dragonflies. Miscellaneou : Quantity of fibrous vegetable matter.

No. 66.— ♀, 1 lb.; 3 p.m. 17 February, 1934. Collected by Dr. S. Brandon. Fly: Tarana.—Coleoptera: 2 Carab beetles (*Clivinia* sp.). Miscellaneous insects: Small quantity of finely divided insect remains.

No. 67.— ♀, 1 lb.; 3.30 p.m. 17 February, 1934. Collected by Dr. S. Brandon. Fly: Tarana.—Coleoptera: 1 *Heteronyx*. Miscellaneous insects: Small quantity of unidentifiable insect remains.

No. 68.— ♀; 4.30 p.m. 17 February, 1934. Collected by Dr. S. Brandon. Fly: Hopper Hackle.—Coleoptera: 1 *Heteronyx* sp., 1 Longicorn beetle (*Phoracantha* sp.). Trichoptera: 16 Caddis cases. Odonata: 3 Zygopterid dragonflies.

No. 69.— ♀, 3 lb.; 4 p.m. 18 February, 1934. Collected by Dr. S. Brandon. Fly: Dragonfly.—Coleoptera: 1 *Heteronyx* sp., 1 Tenebrionid beetle (? gen. et sp.). Hymenoptera: 1 wasp (? gen. et sp.). Trichoptera: 12 Caddis cases. Miscellaneous: 16 quartz pebbles of various sizes, and jagged in contour. Largest ¼ oz.; total weight 1½ oz.

Upper Murrumbidgee River.

No. 70.— ♂, 1 lb.; 11.30 a.m. 23 December, 1933. Collected by Dr. S. Brandon. Coleoptera: 8 *Heteronyx* sp., 3 *Phyllotocus* sp., 1 *Cryptocephalus* sp., 1 *Hydrophyllus* larva. Hymenoptera: 2 wasps (? gen. et sp.). Orthoptera: 1 grasshopper (*Calataria terminifera*). Trichoptera: 1 Caddis case. Miscellaneous insects: Large quantity of finely broken and unidentifiable insect remains.

No. 71.— ? sex; December, 1933. Collected by Dr. S. Brandon.—Coleoptera: 2 *Phyllotocus* sp., 1 *Paropsis* sp. Hymenoptera: 3 bees (? gen. et sp.), 3 Thynnid wasps ♂ ♂ (? gen. et sp.). Lepidoptera: 1 Lepidopterous larva. Odonata: 1 Anisopterid dragonfly nymph. Diptera: 3 heads of flies (Muscoid).

No. 72.— ? sex; December, 1933. Collected by Dr. S. Brandon.—Coleoptera: 4 *Phyllotocus* sp., 5 *Heteronyx* sp., 6 Dryopid beetles (*Simsonia hopsoni*). Hemiptera: 1 *Corixa* sp., 1 Pentatomid bug (? gen. et sp.). Hymenoptera: 1 Thynnid wasp (? gen. et sp.), ♀. Trichoptera: 477 Caddis cases. Ephemeroptera: 62 Mayflies.

No. 73.— ♀, p.m. 1 January, 1934. Collected by Dr. S. Brandon.—Coleoptera: 1 Scarabæid beetle larva, 2 Aquatic beetle larvæ (? *Hydrophyllus*). Trichoptera: 781 Caddis cases.

Barrington River.

No. 74.— ♂, 12 oz.; 27 November, 1933. Collected by Dr. L. May. Coleoptera: 1 *Heteronyx* sp. Hymenoptera: 1 Thynnid wasp ♀ (? gen. et sp.). Trichoptera: 6 Caddis cases and 1 Caddis-fly. Odonata: 2 Anisopterid nymphs. Crustacea: 1 gastrolith from Yabbie (*Parachæraps bicarinatus*). Miscellaneous insects: Quantity of insect remains. Miscellaneous: Quantity of sand and gravel.

No. 75.— ♀, 14 oz.; 27 November, 1933. Collected by Dr. L. May.—Trichoptera: 15 Caddis-flies. Lepidoptera: 1 Lepidopterous larva. Ephemeroptera: 5 Mayflies. Perlaria: 1 Stonefly. Miscellaneous insects: A very large quantity of unidentifiable insect remains.

No. 76.— ♂, 9 oz.; 27 November, 1933. Collected by Dr. L. May.—Trichoptera: 3 Caddis-flies. Odonata: 1 very large Anisopterid nymph. Diptera: 2 *Bibio* sp. Miscellaneous insects: Quantity of insect remains. Crustacea: 1 claw of a small Yabbie (*Parachæraps bicarinatus*). Miscellaneous: Quantity of sand.

No. 77.— ♂, 13 oz.; 27 November, 1933. Collected by Dr. L. May.—Trichoptera: 5 Caddis cases, 1 gravid ♀ Caddis-fly. Odonata: 1 large Anisopterid nymph. Crustacea: 1 Yabbie (*Parachæraps bicarinatus*).

No. 78.— ? sex; 27 November, 1933. Collected by Dr. L. May.- Coleoptera: 1 Chrysomelid beetle (? gen. et sp.), 1 Gyrinid beetle, 2 *Heteronyx* sp. Hemiptera: 1 Lygæid bug (? gen. et sp.). Hymenoptera: 1 winged ant (? gen. et sp.), 1 *Myrmecia* sp., 3 Thynnid wasps ♀ ♀ (? gen. et sp.). Odonata: 3 Anisopterid nymphs (2 very large). Trichoptera: 2 Caddis-flies. Diptera: 10 *Bibio* sp. Miscellaneous insects: A very large quantity of unidentifiable insect remains. Crustacea: 1 Yabbie (*Parachæraps bicarinatus*). Miscellaneous: 1 large jagged pebble. 1 piece of wood 1 inch in length.

No. 79.— ♂, ? weight; 27 November, 1933. Collected by Dr. L. May. Wet fly.—Coleoptera: 1 Clerid beetle (? gen. et sp.), 1 Click beetle (*Elateridæ*—? gen. et sp.), 4 *Heteronyx* sp., 2 Soldier beetles (*Telephorus* sp.), 1 Coleopterous larva. Hemiptera: 1 Pentatomid bug (? gen. et sp.), 1 Cercopid (? gen. et sp.). Hymenoptera: 1 Thynnid wasp ♀ (? gen. et sp.), 1 Ichneumon wasp. Trichoptera: 1 Caddis case and 2 Caddis-flies. Ephemeroptera: 1 Mayfly. Miscellaneous insects: Small quantity of broken insect remains.

No. 80.— ♂, 1½ lb.; 27 November, 1933. Collected by Dr. L. May.—Coleoptera: 1 *Heteronyx* sp. Trichoptera: 3 Caddis-flies. Ephemeroptera: 1 Mayfly nymph. Diptera: 23 *Bibio* sp., 1 Ortalid fly (? gen. et sp.), 1 Dipterous larva. Miscellaneous insects: Quantity of insect fragments. Crustacea: 1 Crayfish or Yabbie (*Parachæraps bicarinatus*).

No. 81.— ♀, 1 lb.; 27 November, 1933. Collected by Dr. L. May.—Coleoptera: 1 *Heteronyx* sp., 1 Soldier beetle (*Telephorus* sp.). Hymenoptera: 1 Thynnid wasp ♀ (? gen. et sp.). Trichoptera: 1 Caddis case and 2 Caddis-flies. Ephemeroptera: 2 Mayfly nymphs. Diptera: 1 Oncodid fly (? gen. et sp.).

No. 82.— ♀, ? weight; 27 November, 1933. Collected by Dr. L. May. Dry fly: R.A.B.—Trichoptera: 1 Caddis case. Amphibia: 1 frog.

No. 83.— ♂, ? weight; 27 November, 1933. Collected by Dr. L. May. Dry fly: R.A.B.—Coleoptera: 3 Scarabæid beetles (*Heteronyx* sp.), 1 Carab beetle (*Clivinia* sp.), 1 Chrysomelid beetle (? gen. et sp.), 1 Cistelid beetle (? gen. et sp.). Hymenoptera: 1 Ichneumon wasp. Trichoptera: 1 Caddis-fly. Ephemeroptera: 1 Mayfly. Miscellaneous insects: Quantity of unidentifiable insect fragments. Miscellaneous: Mud and pebbles.

No. 84.— ♀, ? weight; 27 November, 1933. Collected by Dr. L. May.—Coleoptera: 2 Soldier beetles (*Telephorus* sp.), 2 Scarabæid beetles (*Heteronyx* sp.), and broken remains of beetles. Neuroptera: 1 brown lacewing (*Micromis* sp.). Trichoptera: 1 Caddis case. Ephemeroptera: 1 Mayfly nymph. Odonata: Wings of Zygopterid dragonflies. Diptera: 6 Mycetophyllid midges (? gen. et sp.), 1 Syrphid fly (*Syrphus viridiceps*). Miscellaneous insects: Quantity of insect remains. Miscellaneous: Mud.

No. 85.— ♂, 14 oz.; 27 November, 1933. Collected by Dr. L. May.—Coleoptera: 1 *Diphucephala* sp., 1 weevil (unidentifiable remains). Trichoptera: 3 Caddis cases, 2 Caddis-flies. Lepidoptera: 6 Lepidopterous larvæ. Odonata: 3 Anisopterid dragonfly nymphs. Diptera: 1 *Bibio* sp. Perlaria: 2 Stone-flies (♂ and ♀ *in cop.*). Miscellaneous insects: Quantity of insect remains. Miscellaneous: Mud.

No. 86.— ♀, 9 oz.; 28 November, 1933. Collected by Dr. L. May.—Trichoptera: 1 Caddis-fly. Odonata: 1 Anisopterid nymph, and wings of Zygopterid dragonflies. Ephemeroptera: 1 Mayfly. Miscellaneous insects: A small quantity of insect fragments.

No. 87.— ♂, 8 oz.; 28 November, 1933. Collected by Dr. L. May.—Coleoptera: 1 Dryopid beetle larva. Trichoptera: 1 Caddis case. Odonata: 1 Anisopterid nymph. Miscellaneous insects: Small quantity of remains. Crustacea: 1 small Yabbie claw (*Parachæraps bicarinatus*).

No. 88.— ♂, 11 oz.; 28 November, 1933. Collected by Dr. L. May.—Coleoptera: 1 small Scarabæid larva. Trichoptera: 1 Caddis case. Odonata: 2 Anisopterid dragonfly nymphs and wing remains of a large imago. Miscellaneous insects: Quantity of finely divided insect fragments. Crustacea: 1 Crayfish or Yabbie (*Parachæraps bicarinatus*).

No. 89.— ♀, 8 oz.; 28 November, 1933. Collected by Dr. L. May.—Coleoptera: Remains of large unidentifiable beetle. Trichoptera: 2 Caddis cases. Crustacea: Oolith from Yabbie (*Parachæraps bicarinatus*).

No. 90.— ♀, 7½ oz.; 28 November, 1933. Collected by Dr. L. May.—Hymenoptera: 1 ant (? gen. et sp.). Odonata: 2 Anisopterid nymphs. Diptera: 1 Mycetophyllid midge (? gen. et sp.).

No. 91.— ♀, 9 oz.; 28 November, 1933. Collected by Dr. L. May.—Coleoptera: 1 *Diphucephala* sp., 2 Soldier beetles (*Telephorus* sp.). Hemiptera: 1 Jassid (? gen. et sp.). Diptera: 1 fly (Oncodidæ). Miscellaneous: Quantity of vegetable matter.

No. 92.— ♀, 7 oz.; 28 November, 1933. Collected by Dr. L. May.—Coleoptera: 3 Soldier beetles, 2 ♂, 1 ♀ (*Telephorus* sp.). Trichoptera: 3 Caddis cases. Hemiptera: 1 Mealy-bug, Bird of Paradise Fly (*Callipappus australe*). Odonata: 1 large Anisopterid nymph, and imagines (6) of Zygopterid dragonflies. Miscellaneous insects: Quantity of broken insect fragments. Crustacea: 1 Yabbie (*Parachœraps bicarinatus*). Vermes: 1 worm (? earth worm).

No. 93.— ♂, 13 oz.; 28 November, 1933. Collected by Dr. L. May.—Coleoptera: 2 Chrysomelid beetles (? gen. et spp.), 2 Soldier beetles (*Telephorus* sp.). Odonata: 8 Zygopterid dragonflies and a quantity of wing remains. Diptera: 1 fly (Oncodidæ). Crustacea: 3 Crayfish or Yabbie claws (*Parachœraps bicarinatus*).

No. 94.— ♂, 9 oz.; 28 November, 1933. Collected by Dr. L. May.—Coleoptera: 2 Chrysomelid beetles (? gen. et sp.). Trichoptera: 1 Caddis-fly. Odonata: 1 Anisopterid nymph. Diptera: 1 Mycetophyllid midge (? gen. et sp.), 1 fly (Oncodidæ). Crustacea: 4 Crayfish (*Parachœraps bicarinatus*) and fragments of others.

No. 95.— ♂, 14 oz.; 28 November, 1933. Collected by Dr. L. May.—Hemiptera: 1 plant bug (Pentatomidæ—? gen. et sp.). Hymenoptera: 1 Hive bee (*Apis mellifica*), 1 bee (? gen. et sp.), 1 winged Bull-dog ant ♀ (*Myrmecia gulosa*). Lepidoptera: 1 Lepidopterous larva. Perlaria: 1 Stonefly (? gen. et sp.). Crustacea: 2 Yabbies (*Parachœraps bicarinatus*).

No. 96.— ♂, 10 oz.; 28 November, 1933. Collected by Dr. L. May.—Coleoptera: 1 Cistelid beetle (? gen. et sp.), 1 *Paropsis* sp., 1 Click beetle (Elateridæ—? gen. et sp.), 1 water beetle (*Hydrophyllus* sp.), 1 Chrysomelid beetle (? gen. et sp.), 1 weevil (? gen. et sp.), 1 Ladybird beetle (*Callineda testudinaria*—Coccinellidæ), 1 Scarabæid beetle (*Heteronyx* sp.). Trichoptera: 4 Caddis cases and 5 Caddis-flies. Odonata: 2 Anisopterid nymphs. Diptera: 1 Fungus midge (Mycetophyllidæ). Thysanoptera: 4 thrips (*Idolothrips spectrum*). Miscellaneous insects: Quantity of finely divided insect remains. Miscellaneous: Vegetable remains.

No. 97.— ♀, 11 oz.; 28 November, 1933. Collected by Dr. L. May.—Coleoptera: Leg and other remains of a large Scarabæid beetle. Trichoptera: 1 Caddis case. Araneidæ: 1 spider (*Epeira* sp.). Miscellaneous insects: A small quantity of insect remains. Miscellaneous: Vegetable remains.

Gummi or Little Manning River.

No. 98.— ? sex, 10 oz.; 5·30 p.m., 12 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Hare's Ear —Orthoptera: 11 grasshoppers (immature), 1 cricket (? gen. et sp.). Trichoptera: 86 Caddis cases. Miscellaneous: A quantity of Algæ.

No. 99.— ♀, 2 lb.; Junction of Black Gunyah and Little Manning River, 14 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Hardy's Favourite.—Hymenoptera: 1 Ichneumon wasp (? gen. et sp.), 1 bee (? gen. et sp.). Orthoptera: 19 grasshoppers (immature). Odonata: 2 Anisopterid nymphs.

No. 100.— ? sex, 12 oz.; Junction of Black Gunyah and Little Manning River. 14 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Wet fly.—Orthoptera: 1 grasshopper (immature). Trichoptera: 18 Caddis cases Odonata: 1 Anisopterid nymph. Miscellaneous: Quantity of Algæ.

No. 101.— ? sex, 1 lb.; Junction of Black Gunyah and Little Manning River, 14 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Cochu Bundu.—Coleoptera: 1 Hydrophyllid larva. Hemiptera: 1 *Corixa* sp. Hymenoptera: 1 winged ant (? gen. et sp.). Orthoptera: 4 grasshoppers (immature). Trichoptera: 20 Caddis cases. Odonata: 2 Anisopterid nymphs.

No. 102.— ? sex, 1 lb.; Junction of Black Gunyah and Little Manning River, 14 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Light coloured fly with red tail.—Orthoptera: 2 grasshoppers (immature). Trichoptera: 9 Caddis cases. Odonata: 2 Anisopterid dragonfly nymphs. Miscellaneous insects: a small quantity of unidentifiable insect fragments.

No. 103.— ? sex, 12 oz.; Junction of Black Gunyah and Little Manning River. Collected by Mr. G. H. Montgomery.—Coleoptera: 1 Soldier beetle (*Telephorus* sp.). Hymenoptera: 1 ant (*Polyrachis* sp.). Orthoptera: 2 grasshoppers (immature). Trichoptera: 5 Caddis cases. Odonata: 1 Anisopterid nymph.

No. 104.— ♀, 11 oz.; Little Manning River, 15 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Red-tipped Palmer.—Hemiptera: 1 *Corixa* sp., 1 Jassid (? gen. et sp.). Orthoptera: 15 grasshoppers (immature). Trichoptera: 1 Caddis case. Odonata: 1 Zygopterid dragonfly.

No. 105.— ♂, 18 oz.; 15 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Hardy's Favourite. [Note.—Taken after thunderstorm, river slightly swollen.] Coleoptera: 1 Scarabæid beetle (*Diphucephala* sp.). Hemiptera: 1 Jassid (? gen. et sp.). Orthoptera: 12 grasshoppers (immature). Hymenoptera: 1 Hive bee (*Apis mellifica*). Odonata: 1 Zygopterid dragonfly, 1 Anisopterid nymph.

No. 106.— ♂, 15 oz.; 16 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Light-brown Hackle. Orthoptera: 1 grasshopper (*Calataria terminifera*). Trichoptera: 11 Caddis cases.

No. 107 — ♂, 28 oz.; 16 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Hackle Red-tail. Orthoptera: 2 grasshoppers (immature). Trichoptera: 4 Caddis-flies. Odonata: 2 Anisopterid nymphs and 1 Zygopterid dragonfly. Araneidæ: 1 Tetragnatha spider, 1 spider (? gen. et sp.). Pisces: 1 small Catfish. [Note.—This fish was definitely not a young trout or other game fish.]

No. 108.— ♀, 10 oz.; 16 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Large Hackle red-tail. Orthoptera: 3 grasshoppers (immature). Trichoptera: 23 Caddis cases. Amphibia: 1 frog.

No. 109.— ♀, 20 oz.; 16 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Hackle red-tail. Coleoptera: 1 Scarabæid beetle (*Heteronyx* sp.), 1 weevil (? gen. et sp.). Hemiptera: 1 Jassid (? gen. et sp.), 1 *Corixa* sp. Hymenoptera: 1 ant (*Polyrachis* sp.). Orthoptera: 1 grasshopper (immature), 2 small crickets (unidentifiable). Trichoptera: 4 Caddis cases. Lepidoptera: 1 large Lepidopterous larva (Noctuidæ). Diptera: 1 fly (Stratiomyidæ) Miscellaneous insects: Quantity of remains. Araneidæ: 1 large spider (*Isopeda* sp.).

No. 110.— ♀, 18 oz.; Junction of Black Gunyah and Little Manning River, 17 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Silver Doctor.—Trichoptera: 322 Caddis cases. Crustacea: 1 Yabbie (*Parachæraps bicarinatus*).

No. 111.— ♀, ½ lb.; Dilgry Creek, 19 February, 1934. Collected by Mr. G. H. Montgomery.—Coleoptera: 1 *Lemodes* sp. Hymenoptera: 1 small Braconid wasp. Trichoptera: 1 Caddis case. Miscellaneous insects: Small quantity (traces only) of broken insect fragments.

No. 112.— ♂, 4 oz.; Dilgry Creek, 19 February, 1934. Collected Mr. by G. H. Montgomery.—Coleoptera: 1 Dryopid beetle larva. Miscellaneous insects: Small quantity of broken insect remains. Miscellaneous: Quantity of vegetable matter.

No. 113 — ♀, ½ lb.; Dilgry Creek, 19 February, 1934. Collected by Mr. G. H. Montgomery.—Coleoptera: 3 Scarabæid beetles (*Heteronyx* sp.). Trichoptera: 3 Caddis cases.

No. 114.— ♂, 6 oz.; Dilgry Creek, 19 February, 1934. Collected by Mr. G. H. Montgomery.—Coleoptera: 1 Scarabæid beetle (*Heteronyx* sp.), 1 Dryopid beetle larva. Trichoptera: 2 Caddis cases. Ephemeroptera: 1 Mayfly nymph. Diptera: 1 Dipterous larva, and remains of others. Vermes: 4 Gordian worms.

Vo. 115.— ♀, ¾ lb.; Dilgry Creek, 19 February, 1934. Collected by Mr. G. H. Montgomery.—Coleoptera: 1 Carab beetle (*Clivinia*), 1 Coleopterous larva. Hemiptera: 1 Reduviid bug (? gen. et sp.). Hymenoptera: 1 ant (*Polyrachis* sp.). Miscellaneous insects: Broken remains.

No. 116.— ♀, 4 oz.; Dilgry Creek, 19 February, 1934. Collected by Mr. G. H. Montgomery.—Hymenoptera: 1 ant (*Polyrachis* sp.). Crustacea: 1 Yabbie (*Parachæraps bicarinatus*). Myriapoda: 1 Millepede (? gen. et sp.).

No. 117.— ♀, 18 oz.; Back Creek near junction with Little Manning River, 20 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Hardy's Favourite.—Coleoptera: 1 Scarabæid beetle (*Heteronyx* sp.). Miscellaneous: Quantity of Algæ.

No. 118.— ♂, 15 oz.; Back Creek near junction with Little Manning River, 20 February, 1934. Collected by Mr. G. H. Montgomery. Fly: Large yellow Hackle.—Crustacea: 1 Yabbie (*Parachæraps bicarinatus*).

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons).

Stomach No.	1	2	3	4	5	6	7	8	8a	9	10	11	12	13	14
Coleoptera—															
Scarabæidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Elateridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chrysomelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cistelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	5	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hydrophyllidæ	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Unidentifiable	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...
Hemiptera—															
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jassidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Corixidæ	2	...	2	...	1	...	...	...	1	1	...	...	...	...	...
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lygæidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coccidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—															
Formicidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Apidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vespidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Neuroptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—															
Acrridiidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Gryllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	265	9	16	18	158	76	565	21	27	6	5	...	2	6	1
Lepidoptera—															
Noctuidæ	...		...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Odonata—															
Anisoptera	...	...	...	...	2	...	...	...	...	...	...	1	...	...	...
Zygoptera	1	...	...	1	...	1	4	1	2	...	...	...	...	...	...
Ephemeroptera	5	...	...	...	...	...	1	...	4	...	...	...	...	7	...
Diptera—															
Oncodidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Muscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thysanoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	*	...	...	...	...	...	...	...	...	*	...	...	...	...	...
Araneidae	...	...	...	...	1	...	...	...	...	...	...	...	...	1	...
Vermes	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Mollusca	4	49	60	...	...	1	...	...	...	...	...	...	...	...	...
Myriapoda	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pisces	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	...	1	...	...	...	...	...	4	...	1	...	...	...
Miscellaneous—															
Sand and Gravel	...	*	...	...	...	...	...	...	...	...	...	...	...	...	...
Algæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bark and twigs	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vegetable matter	...	...	...	...	...	...	*	...	...	...	*	...	...	...	...
Feathers, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued*.

Stomach No.	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Coleoptera—															
Scarabæidæ								1							
Elateridæ															
Chrysomelidæ															
Curculionidæ															1
Dryopidæ															
Carabidæ															
Cleridæ															
Lampyridæ															
Tenebrionidæ															
Cistelidæ															
Dytiscidæ															
Gyrinidæ															
Cerambycidæ															
Hydrophyllidæ												1			
Unidentifiable															
Hemiptera—															
Pentatomidæ															
Jassidæ															
Corixiidæ														1	1
Gerridæ								1		1	2	*			
Lygæidæ															
Reduviidæ															
Coccidæ															
Hymenoptera—															
Formicidæ				5				1					2	1	
Apidæ										1			1	1	
Ichneumonidæ				2											
Vespidæ															
Braconidæ															
Thynnidæ															
Neuroptera															
Orthoptera—															
Acridiidæ				1											
Gryllidæ															
Blattidæ															
Trichoptera	6	10	2		1	18	73	30	2	4			1	5	97
Lepidoptera—															
Noctuidæ															
Unidentifiable															
Odonata—															
Anisoptera	1	1	1		1		1			1		1		1	
Zygoptera		1													
Ephemeroptera	1					6		8							
Diptera—															
Oncodidæ															
Syrphidæ															
Muscidæ															
Tipulidæ															
Mycetophyllidæ															
Stratiomyidæ				1											
Asilidæ															
Bibionidæ					1										
Tachinidæ							1								
Unidentifiable															
Thysanoptera															
Perlaria															
Miscellaneous Insects				*					*			*		*	
Araneidae											1				
Vermes															
Mollusca							1								
Myriapoda															
Amphibia															
Pisces															
Crustacea												1			
Miscellaneous—															
Sand and gravel															
Algæ															
Bark and twigs						*									
Vegetable matter									*						
Feathers, etc.							*								

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

Stomach No.	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Coleoptera—															
Scarabæidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Elateridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chrysomelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cistelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hydrophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hemiptera—															
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jassidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Corixidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Lygæidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coccidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—															
Formicidæ	1	1	2	...	...	...	13	...	...	...	119	10	...	...	...
Apidæ	...	...	...	...	1	...	...	...	...	...	...	1	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vespidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Neuroptera	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—															
Acridiidæ	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Gryllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	...	2	4	1	4	4	...	8	5	13	3	2	1	67	...
Lepidoptera—															
Noctuidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Odonata—															
Anisoptera	...	2	...	7	...	1	...	1	1	...	...	1	...	1	...
Zygoptera	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Ephemeroptera	...	...	...	...	...	...	...	1	...	...	3	...	...	23	...
Diptera—															
Oncodidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Muscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	*	...
Stratiomyidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thysanoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	*	...	...	...	...	...	...	...	...	...	...	...	...	*	...
Araneidae	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermes	...	...	1	...	...	...	...	...	...	...	1	...	...	...	...
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7
Myriapoda	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pisces	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	...	...	...	...	...	...	...	...		...	1	...	1
Miscellaneous—															
Sand and gravel	...	...	...	...	*	...	...	...	...	...	...	...	...	...	...
Algæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bark and twigs	...	...	...	...	...	...	...	...	...	...	...	...	*	...	...
Vegetable matter	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Feathers, etc.	...	...	*	...	...	...	...	...	...	...	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued*.

Stomach No.	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
Coleoptera—															
Scarabæidæ	1	...	20	...	1	...	1	15	...	12	...	26	1	16	2
Elateridæ	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chrysomelidæ	..	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	1	1	...	1
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenebrionidæ	...	...	...	...	...	...	...	...	1	...	...	...	...	2	...
Cistelidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Hydrophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hemiptera—															
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jassidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Corixidæ	...	...	1	...	2	...	...	...	9	...	...	...	...	...	...
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lygæidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coccidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—															
Formicidæ	...	...	...	...	...	...	...	...	...	*	...	...	2	1	...
Apidæ	...	...	...	...	...	...	...	...	...	...	...	3	...	...	1
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vespidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Neuroptera—	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—															
Acridiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1
Gryllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Trichoptera	7	43	45	...	53	15	682	94	420	...	530	1	12	1	1
Lepidoptera—															
Noctuidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	1	1	3	...	...	...	...	...	...	9	...	...	...	...	...
Odonata—															
Anisoptera	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Zygoptera	...	1	12	...	18	...	10	...	2	...	...	...	5	...	1
Ephemeroptera	...	2	...	...	1	...	1	1	1	...	...	...	...	...	...
Diptera—															
Oncodidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Muscidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Tipulidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thysanoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	...	*	...	*	...	*	...	*	...	...	*	...	*	*
Araneidae	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Vermes	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mollusca	...	...	...	...	...	...	...	...	...	...	42	...	...	...	...
Myriapoda	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pisces	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	2	...	...	1	...	1	...	...	...	...	...	...	...	...	...
Miscellaneous—															
Sand and Gravel	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Algæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bark and twigs	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vegetable matter	...	...	*	...	...	...	*	...	...	...	...	*	...	...	...
Feathers, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

Stomach No.	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
Coleoptera—															
Scarabæidæ	6	*	3	1	...	...	...	1	1	1	11	2	9	1	1
Elateridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chrysomelidæ	4	...	...	...	...	...	...	...	...	...	1	1	...	...	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	6	...	...
Carabidæ	...	...	1	1	...	...	2	...	...	...	...	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenebrionidæ	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Cistelidæ	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...
Hydrophyllidæ	...	...	...	...	...	...	...	...	...	...	1	...	...	2	...
Unidentifiable	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hemiptera—															
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Jassidæ	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Corixiidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lygæidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coccidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—															
Formicidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	*	...
Apidæ	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vespidæ	...	...	...	...	...	...	...	...	...	1	2	...	...	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	1	...	...	...	...	...	...	...	...	...	...	3	1	...	1
Neuroptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—															
Acridiidæ	1	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Gryllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	9	2	...	332	...	9		...	16	12	1	...	477	781	7
Lepidoptera—															
Noctuidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	1	1	...	...	...	...	...	...	...	...	...	1	...	...	...
Odonata—															
Anisoptera	...	...	...	...	...	...	...	...	...	...	...	1	...	...	2
Zygoptera	...		256	1	...	*	...	...	3	...	...	...	...	...	...
Ephemeroptera			...	...	...	...	...	...	...	...	...	...	62	...	...
Diptera—															
Oncodidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Muscidæ	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thysanoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	...	...	...	...	...	*	*	...	...	...	...	...	...	*
Araneidae	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermes	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Myriapoda	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pisces	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Miscellaneous—															
Sand and gravel	...	...	...	...	...	...	...	...	...	*	...	...	...	...	*
Algæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bark and twigs	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vegetable matter	...	...	...	...	...	*	...	...	...	...	...	...	...	...	...
Feathers, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*salmo irideus* Gibbons)—*continued.*

Stomach No.	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
Coleoptera—															
Scarabæidæ	...	...	...	2	4	1	1	...	3	2	1	...	...	1	...
Elateridæ	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...
Chrysomelidæ	...	...	...	1	...	...	...	...	...	...	1	...	...	...	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Cleridæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	...	...	...	2	...	1	...	...	2	...	...	...	...	...
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cistelidæ	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hydrophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...		...	1	...	...	...	...	...	...	...	...	...	1
Hemiptera—															
Pentatomidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Jassidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Corixiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lygæidæ	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coccidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—															
Formicidæ	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1
Apidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ichneumonidæ	...	...	...		1	...	...	...	1	...	...	...	...	...	...
Vespidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	3	1	...	1	...	...	...	...	...	...	...	...
Neuroptera	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Orthoptera—															
Acridiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gryllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	15	3	6	2	3	3	3	1	1	1	5	1	1	2	...
Lepidoptera—															
Noctuidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	1	...	...	...	...	...	...	...	...	...	6	...	...	...	...
Odonata—															
Anisoptera	...	1	1	3	...	...	...	...	...	...	3	1	3	...	2
Zygoptera	...	...	...	...	...	...	...	...	...	*	...	...	...	...	...
Ephemeroptera	5		...	...	1	1	2	...	1	1	...	...	...	...	...
Diptera—															
Oncodidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Syrphidæ	...	...	...		...	...	...	...	...	1	...	...	...	...	...
Muscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	6	...	...	...	...	1
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	2	...	10	...	23	...	...	...	...	1	...	...	...	...
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...
Thysanoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Perlaria	1	...	...	...	...	...	...	...	...	...	2	...	...	...	...
Miscellaneous Insects	*	*	...	*	*	*	...	...	*	*	*	*	*	...	...
Araneidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermes	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Myriapoda	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Pisces	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	1	1	1	...	1	...	...	...	...	...	1	1	1	...
Miscellaneous—															
Sand and gravel	...	*	...	*	...	...	...	...	*	...	*	...	...	...	...
Algæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bark and twigs	...	...	...	*	...	...	...	...	...	...	...	...	...	...	...
Vegetable matter	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Feathers, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

Stomach No.	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104
Coleoptera—															
Scarabæidæ	...	1	...	...	...	...	1	1	...	...	...	...	...	...	...
Elateridæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Chrysomelidæ	...	...	...	2	2	...	3	...	...	...	...	...	...	...	...
Curculionidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	2	3	2	...	...	...	...	...	...	...	...	...	1	...
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cistelidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hydrophyllidæ	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hemiptera—															
Pentatomidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Jassidæ	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1
Corixidæ	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lygæodæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coccidæ	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—															
Formicidæ	...	...	...	...	...	1	...	...	...	...	...	1	...	1	...
Apidæ	...	...	...	...	...	2	...	...	1	...	...	...	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Vespidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Neuroptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—															
Acrididæ	...	...	...	...	...	...	...	...	11	19	1	4	2	2	15
Gryllidæ	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	...	...	3	...	1	...	9	1	86	...	18	20	9	5	1
Lepidoptera—															
Noctuidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Odonata—															
Anisoptera	...	...	1	...	1	...	2	...	...	2	1	2	2	1	...
Zygoptera	...	...	6	8	...	...	...	...	...	...	...	...	...	...	1
Ephemeroptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Diptera—															
Oncodidæ	...	1	...	1	1	...	...	...	...	...	...	...	...	...	...
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Muscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thysanoptera	...	...	...	...	...	...	4	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	...	*	...	...	...	*	*	...	...	...	...	*	...	...
Araneidæ	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Vermes	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Myriapoda	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pisces	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	1	2	4	2	...	...	...	...	...	...	...	...	...
Miscellaneous—															
Sand and gravel	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Algæ	...	...	...	...	...	...	...	...	*	...	*	...	...	...	...
Bark and twigs	...	*	...	...	...	...	...	...	...	...	...	...	...	...	...
Vegetable matter	...	...	...	...	...	...	*	*	...	...	...	...	...	...	...
Feathers, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

Stomach No.	105	106	107	108	109	110	111	112	113	114	115	116	117	118	Total.
Coleoptera—															
Scarabæidæ	1	...	...	...	1	...	...	...	3	1	...	...	1	...	148
Elateridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Chrysomelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16
Curculionidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...	3
Dryopidæ	...	...	...	...	...	...	...	1	...	1	...	...	...	...	8
Carabidæ	...	...	...	...	...	...	...	...	...	...	1	...	...	...	9
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Lampyridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Cistelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cerambycidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Hydrophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7
Unidentifiable	...	...	...	...	...	...	1	...	...	...	1	...	...	...	7
Hemiptera—															
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Jassidæ	1	...	...	...	1	...	...	...	...	...	...	...	...	...	6
Corixidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Lygæidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Reduviidæ	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1
Coccidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Hymenoptera—															
Formicidæ	...	...	...	...	1	...	...	...	...	...	1	1	...	...	168
Apidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...	16
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Vespidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Braconidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11
Neuroptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Orthoptera—															
Acridiidæ	12	1	2	3	1	...	...	...	...	...	...	...	...	...	80
Gryllidæ	...	...	...	...	2	...	...	...	...	...	...	...	...	...	3
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Trichoptera	...	11	4	23	4	322	1	...	3	2	...	...	...	...	5,690
Lepidoptera—															
Noctuidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	25
Odonata—															
Anisoptera	1	...	2	...	...	...	...	...	...	...	...	...	...	...	59
Zygoptera	1	...	1	...	...	...	...	...	...	...	...	...	...	...	337
Ephemeroptera	...	...	...	...	...	...	...	...	...	1	...	...	...	...	138
Diptera—															
Oncodidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Muscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11
Stratiomyidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...	3
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	36
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Unidentifiable	...	...	...	...	...	...	...	...	...	1	...	...	...	...	8
Thysanoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Miscellaneous Insects	...	...	...	...	*	...	*	*	...	...	*	...	...	...	...
Araneidæ	...	...	2	...	1	...	...	...	...	...	...	...	...	...	9
Vermes	...	...	...	...	...	...	...	...	...	4	...	...	...	...	8
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	...	164
Myriapoda	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1
Amphibia	...	...	...	1	...	...	...	...	...	...	...	...	...	...	3
Pisces	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Crustacea	...	...	...	...	...	1	...	...	...	...	...	1	...	1	31
Miscellaneous—															
Sand and gravel	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Algæ	...	...	...	...	...	...	...	...	...	...	...	...	*	...	...
Bark and twigs	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vegetable matter	...	...	...	...	...	...	...	*	...	...	...	...	...	...	...
Feathers, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Indicates presence.

Stomach Contents of Brown Trout (*Salmo fario* Linnæus).

Tuross River.

No. 1.— ♀, 2¾ lb.; noon, 4 November, 1933. Collected by Dr. S. Brandon. Fly: Pennell Hackle.—Coleoptera: Unidentifiable beetle remains. Hemiptera: 1 Jassid (? gen. et sp.). Trichoptera: 30 Caddis cases. Odonata: 4 Anisopterid dragonfly nymphs, and 1 Zygopterid nymph. Ephemeroptera: 1 Mayfly nymph. Miscellaneous insects: Quantity of unidentifiable insect fragments. Miscellaneous: Mud and gravel.

No. 2.— ♀, 2¼ lb.; 12·30 p.m., 5 November, 1933. Collected by Dr. S. Brandon. Fly: Pennell Hackle.—Hymenoptera: 1 large ant (unidentifiable). Trichoptera: 9 Caddis cases. Lepidoptera: 8 Lepidopterous larvæ. Odonata: 2 Zygopterid dragonfly nymphs. Ephemeroptera: 1 Mayfly nymph. Miscellaneous: Large piece of bark 2 in. x ½ in. Quantity of green vegetable matter.

No. 3.— ♀, 1½ lb.; 1·15 p.m., 5 November, 1933. Collected by Dr. S. Brandon. Fly: Pennell Hackle.—Trichoptera: 7 Caddis cases. Odonata: 2 Zygopterid dragonfly nymphs. Ephemeroptera: 1 Mayfly and remains of others. Crustacea: 4 shrimps (*Paratya australiensis*).

No. 4.— ♂, 2 lb.; 9 a.m., 7 November, 1933. Collected by Dr. S. Brandon. Fly: Pennell Hackle.—Coleoptera: 1 Cistelid beetle (? gen. et sp.). Orthoptera: 1 Cockroach (*Panesthia* sp.). Trichoptera: 189 Caddis cases. Ephemeroptera: Quantity of partially digested Mayfly remains. Vermes: 1 Gordian worm.

No. 5.— ♀, 4 lb.; 5 p.m., 7 November, 1933. Collected by Dr. S. Brandon. Fly: Pennell Hackle.—Coleoptera: 2 Click beetles (Elateridæ—? gen. et sp.), 26 Scarabæid beetles (*Heteronyx* sp.), 1 Tenebrionid beetle (? gen. et sp.), 1 Longicorn beetle (*Phoracantha* sp.), 2 Chrysomelid beetles (? gen. et sp.). Hemiptera: 1 *Corixa* sp. Orthoptera: 1 grasshopper (*Gastrimargus musicus*). Hymenoptera: 1 bee (*Halictus* sp.). Trichoptera: 90 Caddis cases. Odonata: 1 Zygopterid dragonfly and 1 nymph. Miscellaneous insects: Quantity of insect remains. Miscellaneous: 4 sticks, each 1 inch long, and a quantity of vegetable matter.

No. 6.— ♀, 2¼ lb.; 9 a.m., 11 November, 1933. Collected by Dr. S. Brandon. Fly: Pennel Hackle.—Hemiptera: *Notonecta* sp. Trichoptera: 7 Caddis cases. Lepidoptera: 1 Lepidopterous larva. Ephemeroptera: 2 Mayfly nymphs. Odonata: 6 Zygopterid dragonfly nymphs. Diptera: 1 fly (Dolichopodidæ). Miscellaneous insects: Small quantity of broken fragments. Miscellaneous: Quantity of vegetable matter including 2 grass seeds.

No. 7.— ♂, 2½ lb.; 31 December, 1933. Collected by Rev. W. A. Evans.—Coleoptera: 1 Gyrinid beetle. Trichoptera: 1 Caddis case. Odonata: 2 Zygopterid dragonflies and 1 nymph. Crustacea: 5 shrimps (*Paratya australiensis*). Miscellaneous: Quantity of vegetable matter.

No. 8.— ♀, 2 lb.; 11·30 a.m., 4 January, 1934. Collected by Dr. S. Brandon. Fly: Black Hackle.—Coleoptera: 2 Scarabæid beetles (*Phyllotocus navicularis*). Hemiptera: 1 *Corixa* sp. Trichoptera: 2 Caddis cases. Odonata: 1 Anisopterid nymph. Ephemeroptera: 1 Mayfly.

No. 9.— ♀, $2\frac{1}{2}$ lb.; 6 p.m., 5 January, 1934. Collected by Dr. S. Brandon. Fly: Black Hackle. Trichoptera: 195 Caddis cases. Mollusca: 3 *Bullinus* sp.

No. 10.— ♀, 3 lb.; 8 a.m., 7 January, 1934. Collected by Dr. S. Brandon.—[NOTE.—Taken after flood.]—Coleoptera: 2 large Hydrophyllid beetles (*Hydrous latipalpus*), 1 large Dynastid beetle (? gen. et sp.), 1 Coleopterous larva. Hymenoptera: 1 Bull-dog ant (*Myrmecia gulosa*). Orthoptera: 3 grasshoppers (immature). Trichoptera: 10 Caddis cases. Odonata: 10 Anisopterid dragonfly nymphs, 16 Zygopterid nymphs. Diptera: 1 pupa of Stratiomyiid fly. Miscellaneous insects: Large quantity of unidentifiable insect fragments. Vermes: 9 earthworms. Mammalia: Leg-bones, ribs, etc. of a small mammal (? Mouse). Miscellaneous: Large quantity of mud, bark, and sticks. 6 masses of organic matter ? larvæ.

No. 11.— ♀, $4\frac{1}{2}$ lb.; 8 January, 1934. Collected by Dr. S. Brandon.—Coleoptera: 2 Hydrophyllid larvæ, 1 Scarabæid beetle (*Heteronyx* sp.), 1 Carab beetle (? gen. et sp.). Hemiptera: 7 *Gerris* sp. Trichoptera: 6 Caddis cases. Odonata: 1 Anisopterid nymph. Ephemeroptera: 2 Mayflies. Miscellaneous insects: Quantity of unidentifiable fragments. Araneidæ: 1 spider (? gen. et sp.).

No. 12.— ♀, ? weight; 21 January, 1934. Collected by Rev. W. A. Evans.——Trichoptera: 6 Caddis cases.

No. 13.— ♂, $3\frac{1}{2}$ lb.; 11 a.m., 27 January, 1934. Collected by Dr. S. Brandon. Fly: Hopper Hackle.—Coleoptera: 3 Scarabæid beetles (*Heteronyx* sp.).

No. 14.— ♂, $2\frac{1}{2}$ lb.; 3 p.m., 29 January, 1934. Collected by Dr. S. Brandon. Fly: Black Hackle—Coleoptera: 5 Scarabæid beetles (*Heteronyx* sp.), 2 Scarabæid beetles (*Phyllotocus navicularis*), 1 Carab beetle (? gen. et sp.), Chrysomelid beetle (? gen. et sp.). Hemiptera: 1 Pentatomid bug (? gen. et sp.). Hymenoptera: 1 Ichneumon wasp. Trichoptera: 277 Caddis cases. Odonata: 59 Zygopterid dragonflies (imagines) and 1 nymph.

No. 15.— ♂, $2\frac{3}{4}$ lb.; 11 a.m., 30 January, 1934. Collected by Dr. S. Brandon. Fly: Black Hackle.—Coleoptera: 8 Scarabæid beetles (*Heteronyx* sp.). Hemiptera: 2 *Corixa* sp., 1 Jassid (? gen. et sp.). Trichoptera: 96 Caddis cases. Odonata: 2 Zygopterid dragonflies.

No. 16.— ? sex, 2 lb.; 5·30 p.m., 5 February, 1934. Collected by Dr. S. Brandon.—Fly: Hopper Hackle.—Coleoptera: 11 Scarabæid beetles (*Heteronyx* sp.), 3 *Phyllotocus navicularis*. Hemiptera: 2 *Corixa* sp. Hymenoptera: 1 Thynnid wasp ♂ (? gen. et sp.). Orthoptera: 1 grasshopper (immature). Trichoptera: 1 Caddis case.

No. 17.— ♀, ? weight; 11 a.m., 10 February, 1934. Collected by Dr. S. Brandon. Fly: Black Hackle.—Coleoptera: 2 *Heteronyx* sp., 1 Hydrophyllid larva. Odonata: 6 Zygopterid dragonfles (imagines), and 1 Anisopterid dragonfly (imago). Araneidæ: 1 spider (*Araneus* sp.).

No. 18— ♀, $1\frac{1}{2}$ lb.; 6·15 p.m., 20 February, 1934. Collected by Dr. S. Brandon. Fly: Red Palmer—Trichoptera: 1 Caddis case.

Upper Murrumbidgee River.

No. 19.— ♀ 1¼ lb.; 11 a.m., 23 December, 1933. Collected by Dr. S. Brandon.—Coleoptera: 1 Hydrophyllid larva. Orthoptera: 1 grasshopper (*Calataria terminifera*). Trichoptera: 1 Caddis case. Lepidoptera: 1 Lepidopterous larva. Odonata: 3 Anisopterid dragonfly nymphs.

No. 20.— ♂, 1½ lb.; 3 p.m., 27 December, 1933. Collected by Dr. S. Brandon, Fly: Pennell Hackle.—Coleoptera: 2 Scarabæid beetles (*Phyllotocus* sp.). 1 Gyrinid beetle (? gen. et sp.). Lepidoptera: 2 Lepidopterous larvæ. Odonata: 1 Anisopterid nymph. Miscellaneous insects: Quantity of insect fragments. Araneidæ: 1 spider (*Araneus* sp.).

No. 21.— ? sex, 2 lb.; 1 p.m., 29 December, 1933. Collected by Dr. S. Brandon. Coleoptera: 1 Flower Chafer (*Polystigma punctatum*), 2 Scarabæid beetles (*Phyllotocus* sp.), 1 weevil (*Belus* sp.), 1 Carab beetle (*Clivinia* sp.), 1 Soldier beetle (*Telephorus* sp.). Hemiptera: 1 Reduviid bug (? gen. et sp.). Hymenoptera: 1 Hive Bee ♂ (*Apis mellifica*), 1 bee (? gen. et sp.), 5 Thynnid wasps, 2 ♀ and 3 ♂ (? gen. et sp.). Orthoptera: 8 grasshoppers (*Calataria terminifera*). Trichoptera: 13 Caddis cases, and 1 Caddis-fly. Odonata: 1 Anisopterid dragonfly, and 1 Zygopterid dragonfly (imagines). Diptera: 1 fly (Asilidæ—? gen. et sp.). Mecoptera: 1 Scorpion-fly (? gen. et sp.). Miscellaneous insects: Large quantity of unidentifiable insect fragments.

No. 22.— ? sex, 3¾ lb.; 30 December, 1933. Collected by Dr. S. Brandon.—Coleoptera: 1 Scarabæid beetle (*Heteronyx* sp.). Hemiptera: 1 *Corixa* sp.

No. 23.— ♀, 1½ lb.; December, 1933. Collected by Dr. S. Brandon. Fly: Jungle Cock.—Coleoptera: 3 Carab beetles (*Clivinia* sp.), 1 beetle (Malacodermidæ), 1 Scarabæid beetle (*Heteronyx* sp.). Hymenoptera: 2 Thynnid wasps, ♂ and ♀ (? gen. et sp.). Orthoptera: 2 grasshoppers (immature). Trichoptera: 7 Caddis cases. Lepidoptera: 1 Lepidopterous larva. Miscellaneous insects Quantity of remains. Miscellaneous: Mud.

No. 24.— ♀, 1 lb.; 4·30 p.m., December, 1933. Collected by Dr. S. Brandon.—Coleoptera: 1 Hydrophyllid beetle larva, 1 *Diphucephala* sp., 8 *Heteronyx* sp., 3 *Phyllotocus navicularis*, 1 Pumpkin beetle (*Aulacophora hillaris*), 1 Dung-beetle (*Onthophagus* sp.). Hymenoptera: 1 Ichneumon wasp (? gen. et sp.), 1 Hive Bee (*Apis mellifica*), 1 Thynnid wasp ♂ (? gen. et sp.). Odonata: 6 Anisopterid and 2 Zygopterid dragonfly nymphs. Diptera: 1 Syrphid fly (*Eristalis tenax*). Miscellaneous insects: Large quantity of unidentifiable insect fragments. Araneidæ: 1 spider (? gen. et sp.).

No. 25.— ? sex, December, 1933. Collected by Dr. S. Brandon.—Coleoptera: 1 beetle (Mordellidæ), 1 Click beetle (*Elateridæ*—? gen. et sp.), 2 *Heteronyx* sp., 2 *Diphucephala* sp., 30 *Phyllotocus navicularis*, 1 *Anoplognathus* sp. Hymenoptera: 3 winged ants (? spp.). Orthoptera: 1 grasshopper (immature). Lepidoptera: 1 large Lepidopterous larva (Noctuidæ). Miscellaneous insects: Large quantity of broken and unidentifiable remains. Miscellaneous: Quantity of mud.

No. 26.— ♀, 1¾ lb.; 11·30 a.m., December, 1933. Collected by Dr. S. Brandon.—Coleoptera: 1 *Heteronyx* sp., 1 *Phyllotocus* sp., 1 Coleopterous larva. Hemiptera: 1 Cicada (? gen. et sp.). Trichoptera: 1 Caddis case. Odonata: 1 Anisopterid nymph.

No. 27.— ♂, 1 lb.; 11·30 a.m., December, 1933. Collected by Dr. S. Brandon.—Coleoptera: 3 Scarabæid beetles (*Phyllotocus* sp.), 1 Dung-beetle (*Onthophagus* sp.), Head of a Dytiscid beetle. Hemiptera: 1 *Corixa* sp. Hymenoptera: 1 ant (*Iridomyrmex* sp.). Trichoptera: 8 Caddis cases. Odonata: 1 Anisopterid dragonfly nymph. Ephemeroptera: 1 Mayfly nymph. Miscellaneous: Quantity of leaves, sticks, etc.

Summary of Stomach Contents of Brown Trout (*Salmo fario* Linnæus).

Stomach No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Coleoptera—														
Scarabaeidæ	...	...	...	...	26	...	...	2	...	1	1	...	3	7
Elateridæ	*	...	...	...	2	...	...	...	...	...	...	...	...	...
Chrysomelidæ	...	...	...	...	2	...	...	...	...	...	...	...	...	1
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mordellidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	1	...	...	1
Lampyridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenebrionidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Cistelidæ	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Hydrophyllidæ	...	...	...	...	...	...	...	...	...	1	2	...	...	...
Unidentifiable	...	*	...	...	...	...	...	...	...	1	...	...	...	...
Hemiptera—														
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Jassidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Corixidæ	...	...	...	...	1	...	...	1	...	...	...	...	...	...
Gerridæ	...	...	...	...	...	...	...	...	...	...	7	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Notonectidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Cicadidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—														
Formicidæ	...	1	...	...	...	...	...	...	...	1	...	...	...	...
Apidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—														
Acrididæ	...	...	...	...	1	...	...	...	...	3	...	...	...	...
Blattidæ	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Trichoptera	...	30	9	7	189	90	7	1	2	195	6	6	...	277
Lepidoptera—														
Noctuidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	8	...	...	...	1	...	...	...	...	...	...	...
Odonata—														
Anisoptera	...	4	...	...	...	...	...	...	1	...	...	...	...	...
Zygoptera	...	1	2	2	...	2	6	3	...	...	...	...	...	60
Ephemeroptera	...	1	1	1	*	...	2	...	1	...	2	...	...	...
Diptera—														
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dolichopodidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Mecoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	*	...	...	...	*	*	...	...	...	*	...	...	...
Araneidae	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Vermes	...	...	...	1	...	...	...	...	...	9	...	...	...	...
Mollusca	...	...	...	...	...	...	...	...	3	...	...	...	...	...
Mammalia	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Crustacea	...	...	4	...	...	...	5	...	...	...	...	...	...	...
Miscellaneous—														
Sand and Gravel	*	...	...	...	...	...	...	...	...	*	...	...	...	...
Bark and Twigs	...	*	...	...	*	...	...	...	...	*	...	...	...	...
Vegetable Matter	...	*	...	...	*	*	*	...	...	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Brown Trout (*Salmo fario* Linnæus)—*contd.*

Stomach No.	15	16	17	18	19	20	21	22	23	24	25	26	27	Total
Coleoptera—														
Scarabaeidæ	8	14	2	...	...	2	3	1	1	13	35	2	4	125
Elateridæ	...	...	...	...	...	...	...	...	...	1	1	...	...	4
Chrysomelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Curculionidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	1
Mordellidæ	...	.	...	...	...	...	...	...	...	...	1	...	...	1
Carabidæ	...	...	...	...	...	...	1	...	3	...	...	...	...	6
Lampyridæ	...	...	...	...	...	...	1	...	1	...	...	...	...	2
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cistelidæ	...	...	...	...	...	.	...	...	...	...	...	...	...	1
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	1
Gyrinidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	2
Cerambycidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Hydrophyllidæ	...	...	1	...	1	...	...	...	...	1	...	...	...	7
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	1	...	2
Hemiptera—														
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Jassidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	2
Corixiidæ	2	2	...	...	...	...	...	1	...	...	...	...	1	8
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	7
Reduviidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	1
Notonectidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cicadidæ	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Hymenoptera—														
Formicidæ	...	...	...	...	...	...	...	...	...	...	3	...	1	6
Apidæ	...	...	...	...	...	...	2	...	...	1	...	...	...	4
Ichneumonidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	2
Thynnidæ	...	1	...	...	...	...	5	...	2	1	...	...	...	9
Orthoptera—														
Acridiidæ	...	1	...	...	1	...	8	...	2	...	1	...	...	17
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Trichoptera	96	1	...	1	1	...	14	...	7	...	...	1	8	958
Lepidoptera—														
Noctuidæ	...	...	...	...	...	...	...	...	...	...	1	...	...	1
Unidentifiable	...	...	...	...	1	2	...	...	1	...	...	...	...	13
Odonata—														
Anisoptera	...	1	...	...	3	1	1	...	...	6	...	1	1	30
Zygoptera	2	6	...	...	...	...	1	...	...	2	...	...	...	103
Ephemeroptera	...	...	...	...	...	...	...	...	...	...	...	...	1	9
Diptera—														
Syrphidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	1
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Asilidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	1
Dolichopodidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Mecoptera	...	...	...	...	...	...	1	...	...	...	...	...	...	1
Miscellaneous Insects	...	...	...	...	...	*	*	...	*	*	*	...	...	...
Araneidea	...	1	...	...	...	1	...	...	...	1	...	...	...	4
Vermes	...	...	...	...	...	...	...	...	...	...	...	...	...	10
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Mammalia	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Crustacea	...	...	...	...	...	...	...	...	...	...	...	...	...	9
Miscellaneous—														
Sand and Gravel	...	...	...	...	...	...	...	...	*	...	*	...	...	...
Bark and Twigs	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vegetable Matter	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Indicates presence.

Stomach Contents of Loch Leven Trout (*Salmo levenensis* Walker).

Tuross River.

No. 1.— ♀, 2 lb.; 6 p.m., 8 November, 1933. Collected by Dr. S. Brandon.—Fly: Pennell Hackle.—Coleoptera: 1 Coleopterous larva (? *Paropsis*), Remains of beetle (? gen. et sp.). Hemiptera: 1 *Corixa* sp. Trichoptera: 23 Caddis cases. Lepidoptera: 1 Lepidopterous larva. Odonata: 76 Zygopterid dragonfly nymphs. Ephemeroptera: 9 Mayfly nymphs. Diptera 1 fly (? gen. et sp.).

No. 2.— ♀, 2¼ lb.; 10 a.m., 3 March, 1934. Collected by Dr. S. Brandon. Fly: Dragon Fly.—Lepidoptera: 16 moths (Noctuidæ) and stomach crammed with remains of others. Diptera: 1 Blowfly (*Lucilia* sp.). Vermes: 1 Gordian worm.

Acknowledgment.

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Sydney: Alfred James Kent, I.S.O., Government Printer—1934.

STUDIES IN ICHTHYOLOGY.
No. 9*.

By

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Ichthyologist, Australian Museum.

(Plate xviii, texts-figs. 1–11.)

Family **GONOSTOMATIDAE.**

Sub-family **Gonostomatinae.**

Narooma, gen. nov.

Orthotype, *Narooma benefica*, sp. nov.

The reduced number of anal rays (12 instead of usually more than 20) is the main feature which separates this genus from all the others in the family. *Gonostoma raoulensis* Waite 1910 is apparently congeneric.

Narooma benefica, sp. nov.

D. 8 (+?); A. 12.

Head (9 mm.) 3·3, depth (6) 5 in standard length (30). Eye (3) 3, interorbital (2) 4·5, upper jaw (6·5) 1·3 in head.

Photophore formula : $\frac{0}{6} + \frac{12}{16} + \frac{10}{9} + \frac{0}{13}$ on body.

General facies of *Gonostoma raoulensis* Waite[1].

A row of fine, unequal teeth on jaws and roof of mouth. Gill-rakers slender and numerous. A large photophore below eye and another before it. Suborbital not enlarged. Four photophores between maxilla and operculum. Six photophores along chin under gill-flap. A photophore at the mandibulary symphysis. Two rows of photophores along lower part of body, and a single row on tail. Upper row ceasing over vent, lower row continuous with the series on the tail.

Body moderately elongate, compressed, covered with deciduous cycloid scales.

Dorsal originating well in advance of anal, but behind origin of ventrals. Apparently no adipose dorsal fin. Caudal forked.

General colour (in alcohol) silvery, becoming brown on caudal peduncle and along back. A dark blotch on each scale on the back, the blotches forming spaced spots as the chromatophores descend lower on the sides towards the caudal peduncle. Photophores bluish-black and yellowish. Eye bluish. Fins white.

Described from the holotype of the species, a specimen, 30 mm. in standard length or nearly 1½ inches overall.

Locality.—Found washed up on a beach near Narooma, southern New South Wales, in September, 1930, by G. P. Whitley. Possibly it had been brought up from deep water by the trawlers in the vicinity of Montague Island and was later cast ashore, where it was slightly attacked by beach crustacea. (Australian Museum regd. No. IA. 4647.)

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* For No. 8, see Records of The Australian Museum, Vol. xix, No. 2, 1934, p. 153.

[1] Waite.—Trans. N.Z. Inst. xliii, 1910, p. 373, pl. xxxv, fig. 1: Raoul I., Kermadec Group.

Family TACHYSURIDAE.

Genus **Cinetodus** Ogilby, 1898.

Cinetodus Ogilby, Proc. Linn. Soc. N. S. Wales, xxiii, 1, 1898, p. 32. Orthotype, *Arius froggatti* Ramsay and Ogilby.

Cinetodus froggatti (Ramsay and Ogilby).

(Figure 1.)

Arius froggatti Ramsay and Ogilby, Proc. Linn. Soc. N. S. Wales (2), 1, May 25, 1886, p. 14. Strickland River, New Guinea; coll. W. W. Froggatt, Roy. Geogr. Soc. Exped. 1885. Type in Austr. Mus., regd. No. B.9936. *Id.* Weber, Nova Guinea ix, 1913, pp. 536 and 608. *Id.* Weber and Beaufort, Fish Indo-Austr. Archip. ii, 1913, pp. 276 and 307.

Cinetodus froggatti Ogilby, Proc. Linn. Soc. N. S. Wales, xxiii, 1, 1898, p. 32.

Tachysurus froggatti Fowler, Mem. Bishop Mus. x, 1928, p. 62, *et ibid.* xi, 1934, p. 391.

Although it has been well described, a figure of this species has long been a desideratum, and the accompanying illustration has been prepared from the still unique holotype.

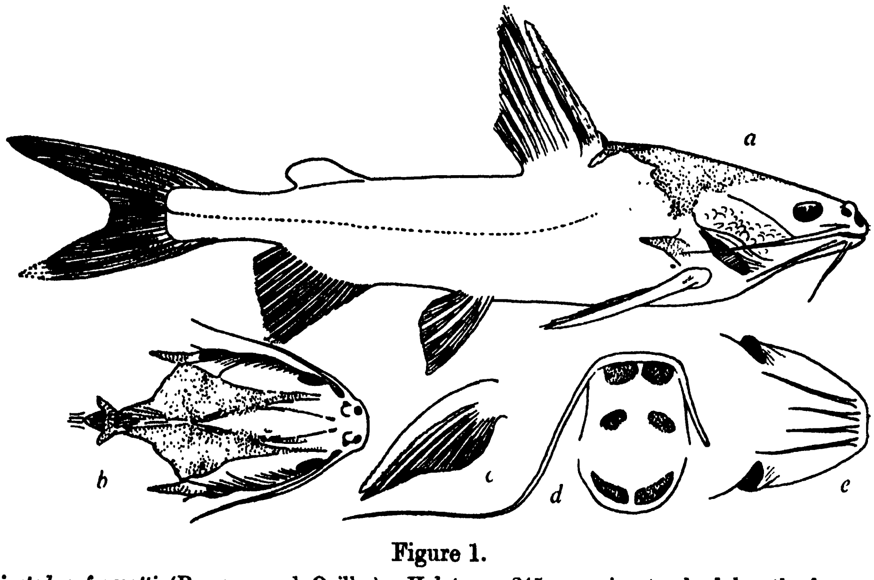

Figure 1.

Cinetodus froggatti (Ramsay and Ogilby). Holotype, 245 mm. in standard length, from the Strickland River, New Guinea. Austr. Mus. regd. No. B. 9936. (*a*) lateral view; (*b*) dorsal view of head; (*c*) pectoral fin; (*d*) dentition: (*e*) ventral view of head. Gilbert Whitley, *del.*

Family LEPTOCEPHALIDAE.

Subfamily **Scalanagoinae**, nov.

Conger eels with the lateral line sending off numerous vertical branches upwards and downwards.

Scalanago, gen. nov.

Orthotype, *Scalanago lateralis*, sp. nov.

A remarkable genus of conger eels found washed up on an ocean beach near Sydney in association with examples of the Little Conger, identified by authors as *Congermuraena*[2], this new form was first noticed by the late A. R. McCulloch, who did not name or describe it, but made the following manuscript note :—

"*Leptocephalidæ*. Gen. et sp. ? Three specimens, 3¾–5½ inches long, from Bondi Beach, have the general appearance of *Congermuraena*, but differ markedly in having an elaborate exposed mucigerous system by which they can be immediately recognized. There is no trace of any such system in *Congermuraena*, though I have carefully compared many specimens of similar size; they have a series of open pores which are wanting in the new form. The snout is also somewhat shorter than in *Congermuraena*, but the dentition and all other characters appear very similar. These three specimens were found stranded together with *Congermuraena*."

The present writer has searched the local beaches regularly for about twelve years, but has obtained only the Little Conger (*Congermuraena*), which is apparently common on the continental shelf and is cast ashore after storms, and has not succeeded in finding the new form, which is now described.

Head conic, the upper jaw projecting beyond the lower. Skin soft and naked and crossed by prominent mucus canals. Two large canals follow the opercular margin and others trespass on the upper part of the eye, which is very large and covered with skin, which conceals the narrow interorbital. There is a median bony crest above the snout and before the eyes, and others near the posterior nostrils, but these are covered with skin also. The anterior nostrils are rather tube-like and rest between the upper lip and the lower part of the snout; they are narrowly separated from the exposed premaxillary teeth : the posterior nostrils are low-rimmed orifices just before the eyes. The upper lip has three well-developed labial bones which support its lateral membranous ridges like the ribs of an umbrella. This lip is separated from the teeth by a flat intermediate area and is without an upturned flange. The maxillary reaches to below middle of eye. Bands of close-set, conic teeth in each jaw, largest anteriorly, not forming a cutting edge, and none of them molariform. The large premaxillary teeth are external to the mouth, on the lower surface of the snout, but there is no median ridge or pocket, nor are there pores in front of them. A band of teeth, some of which are larger than the others, extends along the vomer and tapers posteriorly; these vomerine teeth are separated from the premaxillary ones by the confluent maxillary series. No palatine teeth. Tongue rounded, finely papillate, and joined to floor of mouth by a median connection. The preopercular and opercular bones and seven branchiostegal rays are visible through the skin. No jugostegalia[3]. Gill-openings well separated, situated just before pectorals, their length much less than eye-diameter, and their margins directed downwards and backwards.

Body elongate, naked, rounded anteriorly and compressed posteriorly; the tail is much longer than the head and body, and the trunk is notably longer than the head. The lateral line originates over the preoperculum and runs continuously, not as a series of pores, almost to the tip of the tail. Along its course it gives off long upward and downward branches, giving a somewhat ladder-like appearance. The

[2] Actually, the genus *Congermuraena* Kaup (Archiv. Naturg. xxii, 1, 1856, p. 71) has no standing, because Bleeker selected *Muraena balearica* Delaroche as the genotype. This action made *Congermuraena* a synonym of *Ariosoma* Swainson (Nat. Hist. Class. Fish. Amphib. Rept. i, Oct., 1838, p. 220) with the same type. The Australasian *Congermuraena habenata* (Richardson) is not congeneric and will, I understand, be renamed in a paper being prepared by my colleague, Mr. L. T. Griffin, of Auckland.

[3] Parr.—Copeia, 1930, No. 3, p. 71, fig. 2.

anterior downward branches meet their fellows across the breast and the first four or five converge towards the isthmus, but on the tail and along the back the branches of the lateral line do not meet medially.

Dorsal fin commencing a little behind the head, over the middle of the pectoral fin; it is highest over the middle of the body. Anal fin originating well within the anterior half of the fish, and, like the dorsal, joined to a very small caudal fin. Pectorals finely pointed, longer than upper jaw.

Scalanago lateralis, sp. nov.

(Figure 2.)

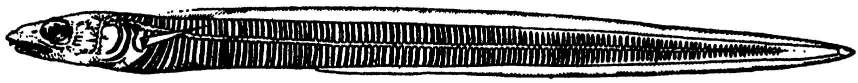

Figure 2.

Scalanago lateralis Whitley. Holotype, 140 mm. long, from Bondi, N.S. Wales. Austr. Mus. regd. No. IA. 5891. G. P. Whitley, *del.*

Br. 7. D. over 180, but slightly damaged and with the rays invested with skin which makes counting difficult. A. over 150. P. 13. C. 8. L. lat. with 116 branches on body, the posterior ones being very small.

Head (21 mm.) nearly 7, greatest depth (9) 15·5 in total length (140). Eye (5) 4·2, snout (6) 3·5, interorbital (2) 10·5, upper jaw (7·5) 2·8, pectoral (10) 2·1 in head. Distance from snout to vent (51) 2·7, from vent to tip of tail (88) 1·5, from snout to dorsal origin (24) 5·9 in total length.

General characters as defined for the genus.

Colour (in alcohol) uniform straw-yellowish. Probably silvery or whitish in life; certainly not black or dusky. Eyes silvery and bluish. Edges of fins dark brownish.

Described from the holotype of the species, the largest of three specimens, 90, 95, and 140 mm. long, or about 5½ inches in total length.

Locality.—Bondi Beach, near Sydney, New South Wales; cast ashore after storm in January, 1922. Collected and presented by Messrs. William Barnes and R. Hawkins. Austr. Mus. regd. Nos. IA.5891 (holotype) and 590 (paratypes). Also some "old collection" specimens from Maroubra, New South Wales.

The two paratypes show that the fins are colourless at first and later become infuscated, and their pectorals are not so attenuated as those of the type. The skin of the head is very adipose and conceals the bony ridges, and the general denseness of the integument is probably correlated with the elaborate lateral line system. The paratypes have 115 to 118 downward branches of the lateral line on the body. In other particulars, they agree with the holotype.

Dissection of a paratype shows that there are seven branchiostegal rays. The gill-rakers are vestigial, numbering about 8 large plus 8 small knobs on the lower part of the first branchial arch. No pseudobranchiae. Heart situated close behind gills. No subdermal scutes. Last caudal vertebra not much expanded. The vertebræ roughly correspond to the branches of the lateral line. Peritoneum dark coppery interiorly; stomach very dark brown.

Subfamily **Leptocephalinae.**

Nesocongrus, gen. nov.

Orthotype, *Congermuraena howensis* McCulloch and Waite[4] = *Nesocongrus howensis.*

Head with large pores. Anterior nostril separated from the mouth by the lip somewhat as in *Leptocephalus labiatus* (Castelnau). The dentition has been figured elsewhere[5] and consists of acicular teeth on jaws and both cardiform and molariform teeth on the vomer.

Lateral line normal. Dorsal fin originating over the operculum, and thus much farther forward than is usual in the family Leptocephalidæ.

Forskalichthys, gen. nov.

Orthotype, *Conger cinereus* Rüppell[6] = *Forskalichthys cinereus.*

Differs from *Conger* = *Leptocephalus* in having the mouth reaching beyond the eye, in the position of the gill-openings, and in having the dorsal fin high and conspicuously bordered with black, also the body is more slender. The Red Sea genotype may now be known as *Forskalichthys cinereus*, but it is noteworthy that Australian specimens agree better with the form called *Conger noordzieki* by Bleeker.

North Queensland specimens have the dorsal commencing above middle of pectoral. Length from tip of snout to vent just about half the length from vent to tip of tail, even in the young. Maxilla extending to below hinder margin of eye, thus agreeing with the text but not the figure in Bleeker's "Atlas." Eye large, about $1\frac{1}{2}$ in snout. Head more than half length of trunk. Coloration dark above and light below. A dark streak extends obliquely downwards along upper margin of lips. Dorsal and anal with broad blackish borders.

Family **NETTASTOMATIDAE.**

Genus **Chlopsis** Rafinesque, 1810.

Dietrichthys, subg. nov.

Orthotype, *Chlopsis* (*Dietrichthys*) *finitimus*, sp. nov.

A very attenuated eel, with the head acutely tapering, the upper jaw being the longer and overhung by the snout. Mouth large, extending beyond eye, and with very numerous canines and a series of vomerine fangs. Eye small. Nostrils lateral. Gill-openings small, lateral. Opercular elements well-developed but entirely covered by integument. No jugostegalia.

Head and trunk subequal in length. Body elongate, naked. Tail over three times the length of the rest of the fish.

No pectoral or ventral fins. Dorsal and anal long and low, confluent with the reduced caudal fin.

Coloration plain, the fins with dark margins posteriorly.

Named in honour of Frau Amalie Dietrich, who collected natural history specimens in the Bowen and other districts for the Godeffroy Museum, Hamburg.

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[4] McCulloch and Waite.—Trans. Roy. Soc. S. Austr., xl, 1916, p. 438, pl. xl, fig. 2: Lord Howe Island.
[5] Whitley.—Austr. Mus. Mag., iv, 3, July, 1930, p. 92, fig.
[6] Rüppell.—Atlas zu Rüppell, Reise (Senckenb. Nat. Ges.), Fische, 1830–1, p. 115, pl. xxix, fig. 1: Red Sea.

Chlopsis (Dietrichthys) finitimus, sp. nov.

(Figures 3 and 3A.)

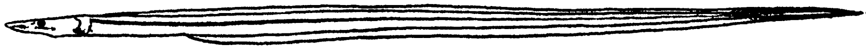

Figure 3.

Chlopsis (*Dietrichthys*) *finitimus* Whitley. Holotype, 363 mm. long, from Whitsunday Passage, Queensland. Austr. Mus. regd. No. IA. 924. G. P. Whitley *del.*

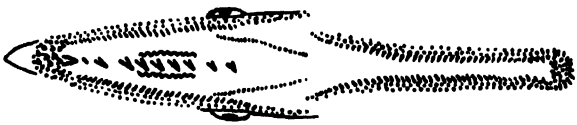

Figure 3A.

Chlopsis (*Dietrichthys*) *finitimus* Whitley. Dentition of holotype. G. P. Whitley *del.*

Head (35 mm.) 10·3, depth of body (*circa* 7) nearly 52, and distance from snout to vent (76) 4·7 in total length (363).

Eye (*circa* 4) nearly 9, interorbital (2) 17·5, snout (13·5) 2·5, and length of caudal fin (4·5) 7·7 in head.

Head bulbous posteriorly and acutely tapering anteriorly. Anterior nostrils inconspicuous, on sides of the snout, which overhangs the mouth; posterior nostrils forming an oblique slit near each eye. Rictus extending well beyond the rather small eye. Bands of erect canines in each jaw, some of them larger than the others. A depressible intermaxillary tooth. A row of about eight fangs along the vomer, flanked by a row of small teeth on each side. Two converging rows of teeth between the maxillary series posteriorly.

General characters as defined for the subgenus. Lateral line a continuous series of thick tubes extending along the elongate body, which is fairly robust anteriorly (though the specimen is slightly shrunken) and ribbonlike posteriorly. No pectorals. Dorsal and anal rays very numerous and fairly long. Caudal fin reduced, its rays long.

General colour (in alcohol) uniform straw-brownish. Some infuscations along the snout; a black area on the ends of the dorsal and anal fins and covering the caudal.

Described and figured from the unique holotype of the species, a specimen 363 mm. or 14¼ inches long. It was collected several years ago in the Whitsunday Passage, Queensland, by Mr. E. H. Rainford, but its exact station is not known; possibly it was a straggler from deep water. Australian Museum regd. No. IA. 924.

This new species seems allied to *Chlopsis fierasfer* Jordan and Snyder[7] from Japan, but differs in proportions as well as in having the rictus extending farther behind the eyes.

[7] Jordan and Snyder.—Proc. U.S. Nat. Mus., xxiii, 1901, p. 860, fig. 10: Wakanoura, Japan.

Family **ECHELIDAE.**

Genus **Muraenichthys** Bleeker, 1864.

Muraenichthys iredalei Whitley.

(Figure 4.)

Muraenichthys iredalei Whitley, Rec. Austr. Mus. xvi, Oct. 7, 1927, p. 5, fig. 1. Michaelmas Cay, North Queensland. Holotype (IA. 2743) in Austr. Mus.

A small eel, 48 mm. long, is determinable as this species. The head is about one-twelfth and the depth about one-twenty-eighth of the length. The form is elongate and subcylindrical, with the vent well within the anterior half of the fish. The exact points of origin of the reduced dorsal and anal fins are difficult to trace, but the dorsal begins behind the vertical of the anal origin. No pectorals. Caudal fairly well developed.

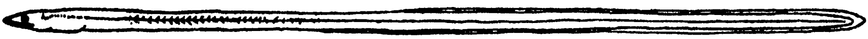

Figure 4.

Muraenichthys iredalei Whitley. Immature example, 48 mm. long, from Murray Island, Queensland. Austr. Mus. regd. No. IA. 6304. G. P. Whitley *del.*

General colour (in alcohol) yellowish, the eyes blue; a few blackish dots along the anterior portion of the lateral line.

Locality—Murray Island, Torres Strait, Queensland. Collected by C. Hedley and A. R. McCulloch. Austr. Mus. regd. No. IA. 6304.

Family **MURAENIDAE.**

Genus **Polyuranodon** Kaup, 1856.

Polyuranodon Kaup, Arch. Naturg. (Wiegmann) xxii, 1, 1856, p. 65. Haplotype, *P. kuhli* Kaup = *Muraena polyuranodon* Bleeker.

A genus of fluviatile or estuarine eels, distinguished from *Gymnothorax* by the more numerous rows of teeth, the reduced anal fin, more elongate habit, and striking coloration.

Polyuranodon polyuranodon (Bleeker).

Muraena polyuranodon Bleeker, Nat. Tijdschr. Ned. Ind. v, 1853, pp. 234 & 248. Ceram, East Indies. Type in British Museum. *Id.* Günther, Journ. Mus. Godef. ix, 17, 1910, p. 421 (Ovalau, Fiji—freshwater).

Polyuranodon kuhli Kaup, Arch. Naturg. (Wiegmann) xxii, 1, 1856, p. 65, and as *P. kuhlii* in Cat. Apod. Fish. 1856, p. 96. New name for *Muraena polyuranodon* Bleeker.

Gymnothorax polyuranodon Bleeker, Atlas. Ichth. iv, 1864, p. 89, pl. clxxiv, fig. 2.

Lycodontis polyuranodon Fowler, Mem. Bish. Mus. x, 1928, p. 54.

Head, about 50 mm. long. Gape, 15. Eye, 3. Interorbital, 4·5. Snout, 7. Gill-opening, 4. Depth of body, about 24. Distance from snout to vent, 315 mm.; from vent to tip of tail, 270.

Form very elongate and compressed. Snout bluntly rounded; profile of head concave over eyes and bulging over nape. Throat without grooves, rounded like the rest of the ventral surface of the body. Anterior nostrils large and tubiform, posterior ones small rimless openings above the anterior margins of the small eyes. Well developed canines are present around each jaw, largest in front of upper jaw. Some hinged depressible fangs on vomer anteriorly and some smaller fangs forming inner rows of maxillary teeth. The lower lip appears to protrude beyond the upper.

The fins are enveloped in adipose tissue and do not extend so far forward as in the example figured by Bleeker. Only the dorsal is well developed, originating well before the vent and some distance behind the head; the anal fin is reduced to a low fold on the posterior part of the tail.

Colour in alcohol, yellowish cream, conspicuously marked with large irregular blackish blotches, densest over the flanks, and more spaced on the belly. The blotches are frequently fused and, though not arranged in regular rows, tend to form longitudinal blackish stripes on the head behind the mouth.

Described from a specimen, 585 mm. or about two feet long, newly added to the Australian Museum collection (registered No. IA.6083).

Locality.—Collected in freshwater rivers in densely wooded country at Buin, south Bougainville Island, about 10 miles from the coast, in April-May, 1934, by Rev. Father J. B. Poncelet, S.M., of the Catholic Mission at Buin. Collector's No. 24. Native name, *peperoka*.

Two others have since been received from the same locality and collector, Sept.-Oct., 1934. Austr. Mus. regd. Nos. IA.6354-55. They were caught with the following species of freshwater fishes :—

Native Name.	Scientific Name.
Pogubu or Tugu...	*Culius niger*.
Lubau	*Glossogobius* sp. (aff. *giuris*).
Tobi	*Paradules marginatus*.
Maramo	*Anguilla megastoma*.
Tugu	*Ophiocara* sp. (aff. *aporos*).
Okorobi	*Dules rupestris*.

Bougainville Island is situated between New Guinea and the main Solomon Islands, so this record adds one more definite locality for the species, which has been listed from the East Indies, New Guinea, Philippine Is., Ebon I. (Marshall Group), and Fiji.

Family **HOLOCENTHRIDAE.**

Genus **Holotrachys** Günther, 1873.

Holotrachys carneus (Ramsay & Ogilby)=**humilis** (Kner & Steindachner).

Myripristis carneus Ramsay & Ogilby, Proc. Linn. Soc. N. S. Wales (2) i, 1886, p. 474. Admiralty Islands, South Pacific. *Id.* Jordan & Seale, Bull. U.S. Bur. Fish. xxv, 1906, p. 222. *Id.* Fowler, Mem. Bish. Mus. x, 1928, p. 109, *et ibid.* xi, 6, 1934, p. 396.

The holotype of *Myripristis carneus* is preserved in the Australian Museum and agrees so well with Günther's figure of *M.* (*Holotrachys*) *lima*[8] that it seems unnecessary to publish another illustration, the only differences observed being the

[8] Günther.—Journ. Mus. Godeff., ix (Fische Südsee iv), 1873, p. 93, pl. lxiii, fig. A.

slightly fewer scales on the lateral line and the rather less pointed snout in Ramsay & Ogilby's example. The original *Myripristis lima* Cuvier & Valenciennes[9] came from Mauritius and is evidently very like the present form, only differing in having more numerous transverse rows of scales and the head and depth about one-third of the total length. Jordan & Seale's figure[10] called *Holotrachys lima* is apparently not that species, nor is it *carneus*, as it shows less rugose suborbitals and maxillaries, a very deep body, and only three anal spines. Jordan & Seale made *Harpage* De Vis[11] a synonym of *Holotrachys*, but the type of *carneus* differs from De Vis' description in having seven instead of five branchiostegal rays and the head less than one-third total length. Kner & Steindachner's description of *Myripristis humilis*[12] agrees with *carneus*, which is thus a synonym thereof.

Family **STROMATEIDAE.**

Genus **Stromateus** Linné, 1758 ?

Stromateus? maculatus Forster.

Stromateus? maculatus Forster, Die Neuesten Reisen nach der Botany Bay i, 1794, Tagebuch . . . von John White, pp. 131-132, No. 7. Based on "A Fish of New South Wales" J. Stockdale, Voy. Gov. Phillip to Botany Bay, ed. 1, 1789, p. 282, pl. 1; ed. 2, 1790, p. 171, pl. —, New South Wales. Not *Stromateus maculatus* Cuv. and Val., Hist. Nat. Poiss. ix, 1833, p. 399.

The "fish of New South Wales" figured by Daniel Butler (who came to Australia in 1788) and engraved in *The Voyage of Governor Phillip to Botany Bay*, 1789, has always puzzled me. The sketch is a rough one, and the identity of the species seemed a matter of little importance until I found that Forster gave it a name in 1794. I am still unable to say what the fish is. It may be an ally of *Platycephalus*, *Seriolella*, or perhaps a young *Coryphæna*.

Several other new names for Australian fishes were proposed by Forster (*op. cit.*), but have escaped notice, even in Sherborn's *Index Animalium*. All of them are synonyms of earlier named species. Thus *Squalus superciliosus* = *Heterodontus portusjacksoni*; *Lophius nigricans* = *Pseudobatrachus dubius*; and *Gasterosteus? serratus* = *Enoplosus armatus*.

As *Stromateus maculatus* Cuv. and Val. is preoccupied, it may be renamed *Stromateus advectitius*, sp. nov. Its bibliography has been given by Evermann and Radcliffe[13].

Family **BELONIDAE.**

Djulongius, gen. nov.

Orthotype, *Belone melanotus* Bleeker.

Cheeks scaly; operculum naked. Intermaxillaries but slightly swollen. Gill-rakers obsolete. Body robust. Dorsal and anal fins long and almost opposite. Caudal peduncle not very strongly depressed and with only a small keel, formed by the lateral line, on each side. Caudal fin strongly forked.

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9 Cuvier and Valenciennes.—Hist. Nat. Poiss., vii, April, 1831, p. 493: Isle-de-France.
10 Jordan and Seale.—Bull. U.S. Bur. Fish., xxv, 1906, p 222, fig. 25.
11 De Vis.—Proc. Linn. Soc. N. S. Wales, viii, 1884, p. 447: Haplotype, *H. rosea*, South Seas.
12 Kner and Steindachner.—Sitzb. Akad. Wiss. Wien, liv, 1, 1866, p. 357, pl. 1, fig. 1: Samoa.
13 Evermann and Radcliffe.—Bull. U.S. Nat. Mus., xcv, 1917 p. 64.

Djulongius melanotus (Bleeker).

Belone melanotus Bleeker, Nat. Tijdschr. Ned. Ind. i, 1850, p. 94. Batavia.

Mastacembelus melanotus Bleeker, Atlas Ichth. vi, 1871, p. 47, pl. cclvi, fig. 2, as *M.choram* (non *Belone choram* Rüppell, 1837).

Tylosurus melanotus Weber & Beaufort, Fish.Indo-Austr. Archip. iv, 1922, p. 127, fig. 47.

Br.15. D.ii/24; A.ii/21; P.i/11; V.i/5; C.13. L.lat 125+149 *circa*.

Eye, 21mm. Upper jaw, at least 140 mm. from eye (tip missing). Head, 207 mm. to end of lower jaw. Interorbital, 26. Postorbital, 43. Depth of body at origin of ventrals, 50. Distance from tip of lower jaw to ventral origin, 440, added to distance from ventral origin to end of middle caudal rays, 290, gives 730 mm. as total length (2 ft. 5 in.), though this is approximate as specimen is curled and hardened in preservative.

Teeth erect, with a well developed series outside the large ones in each jaw. No vomerine teeth. Nostrils large, papillated. Top of head naked, with fine smooth striæ. Cheeks and temples scaly. Maxillary hidden by preorbital. Gill-rakers obsolete.

Body elongate, compressed, rather robust, covered with scales which do not extend on fins or head. Breadth of body about ⅝ its height. Lateral line continuous, sending up a branch below ventral fin, and forming a low keel on each side of the caudal peduncle, which is slightly broader than high.

Dorsal origin very slightly behind that of the anal. The two fins are similar in form, the anterior rays forming a falcate lobe, the median rays long, and the last one in each fin slightly produced. Pectorals broad, pointed. Caudal forked, the lower lobe longer than the upper.

Colour, in alcohol, dark grey above and silvery to yellowish below, the colours well contrasted. Inner axilla of pectoral dark grey. All the fins more or less infuscated. Proximal portion of pectorals and inner rays of ventrals yellowish. Dorsal dark grey; anal similar, except near its base where a yellowish tinge prevails. A blackish spot on upper part of eye.

Locality.—Aviklo village, Möwehafen, New Britain. Obtained by Mr. J. A. Todd. (Austr. Mus. regd. No. IA.6081.)

Family MELANOTAENIIDAE.

Aidaprora, gen. nov.

Orthotype, *Aidaprora carteri*, sp. nov.

Allied to the genera *Rhombosoma* and *Anisocentrus* of Regan 1914, but distinguished by its small mouth, dentition (as described hereunder), form of body, and striking coloration.

Aidaprora carteri, sp. nov.

D. i, v/1, 10 (11); A. i, 20; P. i, 12; V. i, 5; C. 15. L. lat. 33. L. tr. 11.

Head (19 mm.) 3·3, depth of body at dorsal and anal origin (28) 2·2 in standard length (64). Eye (6) 3·1, upper jaw (5) 3·8, snout (4) about 5, interorbital (7) 2·7, pectoral fin (14) 1·3, depth of caudal peduncle (9) 2·1 in head. Predorsal length (32) 50% of standard length.

Anterior part of mouth horizontal; posterior part oblique, not reaching eye. Jaws subequal anteriorly, the lower not included. Intermaxillary separated from rest of jaw by a notch. Fine teeth on jaws and a row of teeth outside upper jaw. Vomerine teeth present. A series of pores around eye, and on snout and occiput. Eye large. Interorbital broad and flat. Fourteen gill-rakers on lower limb of first branchial arch.

Profile strongly excavated over head and gibbous before first dorsal fin, thence arched fairly evenly to the thick caudal peduncle. Breast markedly convex, rest of ventral profile gently sloping.

Body covered with large cycloid scales with entire edges. Genital papilla just behind ventral base. First dorsal originating on a level with anal origin. The first spine is pungent, but the others are weak, flexible and elongate. Second dorsal high posteriorly and, like the anal rays, overreaching the emarginate caudal.

General ground colour in alcohol brownish-yellow, becoming dark brown on the back. About ten broad brown bands along the overlapping scale-rows reaching from shoulder to tail or along belly. A dusky mark over opercle; top of head dusky. Pectorals yellowish, with a small blackish axillary spot. Other fins black with bold yellow chequers. Eyes bluish.

Described from the holotype of the species, a specimen 65 mm. in standard length or about 3¼ inches overall. Austr. Mus. regd. No. I.13091. It is evidently a male, and is the largest of a series, 51 mm. or more in standard length. Specimens with the upper profile much less excavated and the colours lighter and less striking are apparently female. Seven paratypes, Nos. I. 13092–97.

Variation.—The smallest specimen is a young male with only 17 anal rays; otherwise there is no important variation apart from sexual dimorphism.

D. i, iv–v/i, 10–11; A. i (17) 20–21; Sc. 32–33; L.tr. 10–12. Head 3·2 to 3·5, depth 2·3 to 3·2 in standard length. Eye 3·0 to 3·6, upper jaw 3·6 to 4·2 in head. Predorsal length 45 to 50% of standard length.

Locality.—Flinders River and adjacent pools near Hughenden and Richmond, Central Queensland; presented by Mr. Frederick L. Berney in 1914.

I have much pleasure in naming this species after Mr. Alfred Kyrwood Carter, of Clovelly, New South Wales, a keen aquarist who has presented many specimens of fishes to the Australian Museum and has placed his careful notes and accurate drawings of various fishes at my disposal from time to time.

Genus **Amneris**, Whitley, 1935.

Amneris Whitley, Austr. Aquatic Life i, 1, Feb. 1, 1935, p. 37. Orthotype, *Nematocentris rubrostriatus* Ramsay and Ogilby, *sensu stricto*.

A genus of tropical freshwater sunfishes allied to *Rhombatractus* and *Anisocentrus*, but with the following combination of characters:—

A series of fairly large teeth on the upper jaw externally. Jaws subequal anteriorly or lower jaw slightly included. A notch between upper and lateral part of upper jaw; cleft of mouth curved. Gill-rakers short, slender, pectinate; about 15 on lower portion of first gill-arch.

Body elongate rhombic, covered with cycloid scales with entire edges. Lateral line with about 32 scales.

First dorsal fin with one pungent and five flexible, produced spines; second dorsal with a spine and about eleven rays. Anal fin originating below flexible dorsal spines.

This genus approaches *Rhombosoma* Regan, but differs mainly in having a row of enlarged teeth along the outside of the upper jaw instead of bands of very small teeth.

Amneris rubrostriata (Ramsay and Ogilby).

(Figure 5.)

Nematocentris rubrostriatus Ramsay and Ogilby, Proc. Linn. Soc. N. S. Wales (2) i, May, 25, 1886, p. 14. Strickland River, Papua; coll. W. W. Froggatt, Roy. Geogr. Soc. Exped., 1885.

Rhombatractus rubrostriatus Ogilby, Proc. Linn. Soc. N. S. Wales, xxi, 2, 1896, p. 134.

Melanotaenia (*Nematocentris*) *rubrostriatus* Weber, Nova Guinea, ix, 1913, pp. 561 and 608.

Nematocentris rubrostriatus Regan, Proc. Zool. Soc. Lond., 1914, p. 339. Ex McCulloch MS. Not *Anisocentris rubrostriatus* Regan, Trans. Zool. Soc. Lond., xx, 6, 1914, p. 281, pl. xxxi, fig. 3.

Anisocentris rubrostriatus Jordan and Hubbs, Stanford Univ. Ser., Stud. Ichth. 1919, Atherin. p. 22.

Melanotaenia ? rubrostriata Weber and Beaufort, Fish. Indo-Austr. Archip. iv, 1922, p. 295.

Anisocentrus rubrostriatus Fowler, Mem. Bish. Mus., x, 1928, p. 121 (not refs. to Regan or Weber).

Melanotaenia rubrostriatus Fowler, Mem. Bish. Mus. xi, 6, 1934, p. 398.

Amneris rubrostriata Whitley, Austr. Aquatic Life i, 1, Feb. 1, 1935, p. 37, and fig.

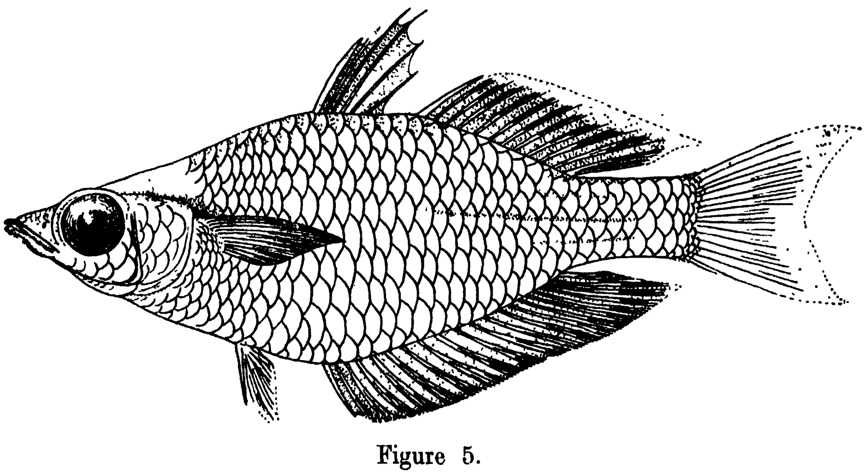

Figure 5.

Amneris rubrostriata (Ramsay and Ogilby). Holotype, 56·5 mm. in standard length, from the Strickland River, Papua. Austr. Mus. regd. No. B. 9949. G. P. Whitley *del.*

D. vi/i, 11 (last branched); A. i, 20 (last branched); P. ii, 12; V. i, 5; C. 15 branched rays. Sc. 34 between operculum and hypural joint. L. tr. 13.

Head (18 mm.) 3·2, depth (22) 2·6 in standard length (59). Eye (5) slightly greater than snout (4·75), shorter than interorbital (7). Pectoral (11·5) 1·4 in head.

Head strongly depressed above, cultrate below, and with the chin oblique. A marked notch between premaxillaries and maxillaries, which are toothed exteriorly. A series of small caniniform teeth, largest anteriorly, and with a band of villiform teeth immediately behind them on the mandibles, which extend beyond the upper jaw anteriorly. Palate apparently toothless.

A curved row of large pores before the eye and one or two more on the flat, scaleless, interorbital; another series or pores surrounding the chin. Snout and chin naked, opercles entire and scaly.

Body compressed, its upper profile less convex than the lower and with the greatest depth below the first dorsal spine. Scales large, cycloid, with slightly truncate margins, not crenulated.

First dorsal fin with a pungent spine and five flexible rays, the second and third of which are produced into filaments. Second dorsal, ventral, and anal fins also preceded by a pungent spine.

The life-colours of specimens about 2½ inches long, according to Mr. Alfred K. Carter, were as follows:—

" Back, olivaceous. Belly: abdomen yellowish, breast white.

" The scales on the sides have a sheen of purple. Between each row of scales, longitudinally, is a stripe. The centre one is dark coloured (either blue-green or brown-green) on the caudal peduncle, the fore part being deep yellow. The other stripes are all yellow, the one immediately below the centre being the most intense, though none are vivid.

" Opercle: green to light blue sheen below, with an orange spot above, which is bordered above by a thin blue green stripe.

" Dorsal and anal fins: at the basal half, deep yellow-orange, with dark red, alternately spaced spots, producing a red and yellow checkered effect. This pattern carries out to the fin edge but is much paler, and the basic colour is pinkish. A *faint* black edging is present. Caudal the same, but the general colour is more reddish and the spots not quite so intense. I now recollect that I neglected to notice the colouring of the spinous dorsal, but believe it to be yellowish without spots. Ventrals, yellowish; pectorals, transparent.

" Iris: yellow, blue streak on lower arc."

Described from a specimen 59 mm. in standard length, or nearly three inches overall.

Locality.—Cairns district, North Queensland. Australian Museum registered No. IA. 5920.

This species is evidently the *Nematocentris rubrostriatus* of Ramsay and Ogilby, the type of which, here figured, has the following characters:—D. i, 5/i, 11 (12); A. i, 20 (21); P. ii/11; V. i/5.; C. 15; Sc. 32. Tr. 11.

Head (15·5 mm.) 3·6, depth of body (20) 2·8 in standard length (56·5). Eye (5) 3·1, interorbital (5·5) 2·8 in head.

The jaws are damaged, but external teeth are clearly visible on the maxillaries, a character recalling Regan's genus *Rhombosoma* rather than his *Anisocentrus*, which seems to be based on a species misidentified as *rubrostriatus* R. & O.

Subfamily **Pseudomugilinae.**

Genus **Pseudomugil** Kner, 1864.

Pseudomugil Kner, Sitzb. Akad. Wiss. Wien liii, 1, 1864, p. 543 and Reise Novara (Fische), 1865, p. 275. Haplotype, *P. signifer* Kner.

Pseudomugil signatus (Gunther).

(Figure 6.)

Atherina signata Gunther, Ann. Mag. Nat. Hist. (3) xx, July 1, 1867, p. 64. Cape York, Queensland (Dämel). Type in British Museum (Nat. Hist.).

Pseudomugil signatus Whitley, Gt. Barr. Reef Exped. Sci. Rept. iv, 9, 1932, p. 278, fig. 2. Low Isles, North Queensland.

In his original description, Günther gave the fin-formula of this species as D.iii/i, 6; A.i, 10, so that it was with some reservation that I identified my Low Isles specimens as *P. signatus*, which was only known from Günther's short description. I gave a figure of a fine Low Isles example with D.v/13; A.12. Since then, Mr. A. K. Carter has submitted specimens from the Cairns district with D.iv–v/7; A.i/9. I therefore wrote to Mr. Norman at the British Museum asking him to examine Günther's type. He very kindly complied with my request and checked the formula as D.iii/7; A.i/10. Thus it seems that the typical *P. signatus* is the mainland form from North Queensland and that the Low Isles Blue-Eye with increased fin-rays is a new subspecies, which may be named *P. signatus affinis*, the type being Austr. Mus. regd. No. IA.4340. There is also a tiny spotted *Pseudomugil* from the mainland which was collected by the Wilkins Expedition and is now becoming a favourite with local aquarists. I propose to deal with this at some later date.

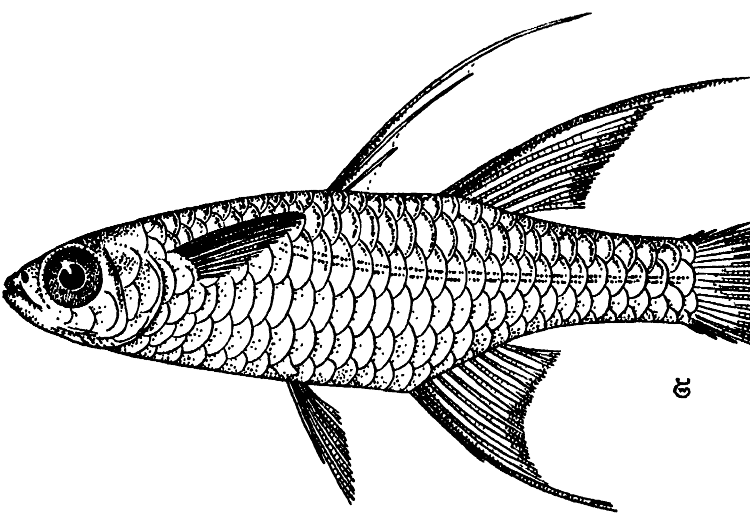

Figure 6.

Pseudomugil signatus (Günther). Holotype, 34 mm. in standard length, from Cape York, Queensland. British Museum (Nat. Hist.) regd. No. 67-5-13-18. Lieut.-Colonel W. P. C. Tenison, D.S.O. *del.*

Lieut.-Colonel W. P. C. Tenison, D.S.O., kindly prepared the accompanying figure of the type of *Pseudomugil signatus* in the British Museum, and his excellent drawing enables comparison to be made with the other forms.

Family **HYPOPLECTRODIDAE.**

Fraudella, gen. nov.

Orthotype, *Fraudella carassiops* sp. nov.

A genus of small marine Serranoid fishes, superficially like *Hypoplectrodes* and *Ellerkeldia*, but having the lateral line running along the back, rather as in *Owstonia*, and with thirteen spines in the first dorsal fin. There is also a slight resemblance to *Pseudochromis* and *Paraplesiops*, under which generic names specimens were found labelled in the " Endeavour " collections.

Fraudella carassiops, sp. nov.

(Plate xviii, fig. 3.)

Br. 6. D.xiii/9; A.iii/10; P.17; V.1/5; C.15. L.lat. 37 + 6. L.tr. 1/1/17.

Head (15 mm.) 3, depth (13·5) 3·3 in standard length (45). Eye (4) 3·7, interorbital (2) 7·5, snout (2·5) 6, upper jaw (10) 1·5, pectoral (8·5) 1·7, caudal peduncle (7) 2·1 in head.

Mouth large, the maxillary extending to below the hinder margin of the moderate-sized eye. Supplemental bone not well defined. Bands of fine teeth on upper jaw with a large tooth at the symphysis, flanked by two hooked canines on each side. Series of prominent hooked teeth on vomer and palatines. Mandibular teeth fairly strong, hooked, and in a single row; there are a few canines anteriorly. Anterior nostrils in a tube-like flap; posterior ones in orifices just before eye. A series of pores along preorbital, encircling eye, and extending over vertex and temples. Preopercular margin rounded, strongly serrate. Operculum with a very weak spine. Branchiostegal membranes united across the very narrow isthmus. Gillrakers spaced, slender and denticulated, only five on the lower portion of the first branchial arch. Cycloid scales on opercles and occiput; rest of head (including jawbones) naked or porous.

Body elevated, compressed, covered with cycloid scales which do not extend on to the fins, and leave an area naked along each side of the dorsals. The lateral line originates over the gill opening, ascends sharply and runs high up along the back, ceasing below the last dorsal rays. The tubes are simple and occur again on each side of the caudal peduncle, four scale rows below the main lateral line series.

The lateral line scales are not intercalated, or modified in outline, but are similar to those on the rest of the body.

Dorsal spines increasing in length backward, but not as long as the rays. Third anal spine longest; the soft dorsal, anal, pectorals, and caudal rounded. Ventrals with a short spine, the first and second rays longest and contiguous at their base, and the third to fifth rays rather weak.

Coloration in alcohol brownish, with the fins yellowish; some dusky infuscations on flanks and dorsal rays, and a series of dusky marks radiating from the bluish eye. In life, however, the general colour was much more brilliant, being like the rich reddish orange of a goldfish (*Carassius*). No crossbands or prominent colour-markings.

Described from the holotype of the species, a specimen 45 mm. in standard length or 2¼ inches overall. A series of eighteen paratypes, the smallest of which is only 16 mm. in standard length, shows no important variation.

Localities.—North-West Islet, Capricorn Group, Queensland; found in a large sponge dredged in 20 fathoms, north of the islet, 27 May, 1931; coll. G. P. Whitley. Holotype: Austr. Mus. regd. No. IA.5093. Also two paratypes (IA.5094). North-West Islet, Queensland; coll. A. A. Livingstone and W. Boardman. Five small paratypes (IA.4788). Near Bowen, Queensland; F.I.V. "Endeavour." Three paratypes (E.2682). Thirteen miles S.E. from Cape Capricorn, Queensland; F.I.V. "Endeavour," 29/7/10. Eight paratypes (IA.6302).

Family **APOGONIDAE.**

Subfamily **Epigoninae.**

Genus **Scepterias** Jordan and Jordan, 1922.

Scepterias Jordan and Jordan, Mem. Carnegie Mus. x, 1, Dec., 1922, p. 44. Orthotype, *S. fragilis* Jordan and Jordan. *Id.* Pietschmann, Bull. Bish. Mus. lxxiii, 1930, p. 13.

A genus recently described from the Hawaiian Islands and now found to be represented in Australian seas by a new species, differing from the genotype mainly in its proportions.

Scepterias lenimen, sp. nov.

Br. 7. D. vii/i, 9; A.ii/9; P.18; V.i/5; C. about 16. L.lat 50. L.tr.3/8.

Head (32 mm.) 2·8, depth (circa 20) about 4·6 in standard length (92). Eye (15·5) 2, interorbital (10) 3·2, snout (7) 4·5, pectoral (19) 1·7, postorbital (11) nearly 3 in head.

Head rounded, bluntly tapering anteriorly. Eyes extremely large and bulging. Maxillary with a supplement bone, extending to below anterior third of eye. Upper jaw not hidden by the narrow preorbital. Mandibles with very elevated rami.

Minute teeth on jaws and vomer. Tongue slender. Ctenoid scales on opercles and temples, extending over the flat interorbital to before the eyes. Anterior nostril an upright slit, posterior nostril an oval orifice. Preopercular margin entire, weak. Operculum with a pungent spine. Gillrakers long and slender.

Body slightly compressed, covered with spaced, deciduous, ctenoid scales, which become enlarged and gelatinous on the continuous lateral line. Dorsals, anal, and ventrals with long pungent spines, the soft portions of the fins with scales on their bases. Four scales between the two dorsals and five between vent and anal fin. Caudal forked.

Colour (in formalin) brown, each scale-pocket densely infuscated. Snout and fins dusky. Eye blue.

Described from the holotype, a specimen 92 mm. in standard length or 4½ inches overall. It is smaller, but better preserved, than the paratypes, one of which is 7 inches long.

Localities.—Great Australian Bight; south from Eucla, 350 to 450 fathoms. F.I.V. "Endeavour," coll., 14 May, 1913. Holotype regd. No. E.3368, also nine paratypes (E.3554 and I.A.6303). Great Australian Bight; S.W. from Eucla, 190–320 fathoms. 126° 45½′ E. long., 4 April, 1913. Two paratypes (E.3581–3582). South of Gabo Island, Victoria; 200 fathoms. F.I.V. "Endeavour," coll. 6 Oct., 1914. Paratype (E.5490).

Range.—Deep water southward of Australia: Victoria, South Australia, Western Australia.

Family **PLESIOPIDAE.**

Assessor, gen. nov.

Orthotype, *Assessor macneilli* sp. nov.

A small black percoid fish, superficially like a *Plesiops* but with the following characters:—

Head somewhat compressed, its upper profile convex over the moderately large eyes. Snout very short. Opercles entire. Maxillary broad, truncate, scaly. No supplemental bone. Check-scales in three rows. A narrow band of villiform teeth in each jaw, the terminal and external teeth largest. Tongue pointed and, like the palate, apparently toothless.

Six branchiostegal rays. Gill-membranes united across the isthmus. Gill-rakers very long, slender, numerous. Posterior nostrils in a short tube. A series of rather large pores around eye and on top of head. Interorbital convex. Head (except snout) covered with imbricate, cycloid scales.

Body strongly compressed; caudal peduncle deep. Scales of the flanks with denticulated margins. Lateral line with a series of tubes, running along the back to below the soft dorsal rays, interrupted, and then followed by a few tubed scales along the middle of the caudal peduncle.

Dorsal fin with eleven spines, increasing in length backward, joined to nine soft rays, forming a pointed lobe. The membrane of the spinous dorsal is not deeply incised. There is a low scaly sheath to all the fins except the ventrals. Anal fin with three spines, the third longest, and nine rays. Pectorals rounded, about as long as the head. Ventrals long and pointed, with four rays. Caudal forked.

Differs from *Grammatonotus* Gilbert, 1905, in having a much broader maxillary, four ventral rays, and longer pectorals.

Assessor macneilli, sp. nov.

Br. 6, D. xi/9; A. iii/9; V. 1/4; P. 15; C. 15; L. lat. 8 + 7. L. tr. 1/1/9.

Head (14 mm.) 3·2, depth (15·5) nearly 3 in standard length (45). Eye (4·5) 3.1, interorbital (4) 3·5, depth of caudal peduncle (8) 1·75 in head. Pectoral fin (13·5) subequal to head.

General characters as described for the genus.

Colour uniform blackish (in spirit), the pectoral fins greyish. In life, Mr. McNeill informs me, the specimen was an intensely dark blue colour.

Described from a single specimen, 45 mm. in standard length, or 2½ inches overall.

Locality.—Hayman Island, Whitsunday Passage, Queensland. Collected by Mr. F. A. McNeill, Christmas, 1934. Austr. Mus. regd. No. IA. 6383.

Family ANTHIIDAE.

Genus **Franzia** Jordan and Thompson, 1914.

Franzia huchtii (Bleeker).

Anthias huchtii Bleeker, Act. Soc. Sci. Indo-Neerl. ii, 1857, p. 38. Amboina. *Id.* Weber and Beaufort, Fish. Indo-Austr. Archip. vi, 1931, p. 103 (refs.).

Anthias mortoni Macleay, Proc. Linn. Soc. N. S. Wales, vii, 1883, p. 253. Pitt Bay, Moresby Island, S.E. New Guinea. *Id.* Weber and Beaufort, Fish. Indo-Austr. Arch. vi, 1931, p. 107. *Id.* Fowler, Mem. Bish. Mus. xi, 6, 1934, p. 411.

Pseudanthias mortoni Jordan and Seale, Bull. U.S. Bur. Fish, xxv, 1906, p. 260.

Anthias margaritaceus Fowler, Mem. Bish. Mus. x, 1928, p. 185. Not of Hilgendorf, 1879. New Guinea record only.

D. x/17–18; A. iii/8; P. 16; V. 1/5. L. lat. 40.

Head (21 mm.) nearly 3·5, depth of body (26) 2·8 in standard length (73). Eye (6) 3·5, interorbital (6) 3·5, snout (3) 7, end of maxillary (4) 5·2 in head. Third dorsal spine about 28 mm. long. Macleay stated, "the space between the eyes convex, and equal to nearly two diameters of the orbit," but even at its broadest part the interorbital is little more than the eye-diameter, and Macleay's error has misled other workers.

Diameter of eye slightly less than interorbital width. Orbital margin entire. Maxillary broad and scaly, reaching beyond middle of eye. A row of acute teeth in each jaw with some canines anteriorly, thus: two small adjacent canines on each side of the premaxilla, a canine pointing forwards and outwards on each side of the mandibulary symphysis, and a large backwardly hooked tooth on each side of mandible. Other teeth on vomer but none on tongue. Head scaly, except near nostrils, and with auxiliary scales or squamulæ.

Preoperculum markedly denticulate, a few spines slightly enlarged at its angle, but no antrorse barbs. A few spines at the angle of the operculum. About seven rows of cheek-scales. Gill-rakers slender and numerous. Pseudobranchiæ present.

Body deep, compressed, covered with cycloid scales, including numerous squamulæ. Lateral line continuous from shoulder to middle of caudal root, not sharply angulated, and with about 40 scales. Three or four rows of scales between lateral line and the scaly sheaths of the dorsal fins.

Dorsal fins united, the third spine much produced, and the last spine not very much shorter than the first ray. Anal with three spines, the second largest; the longest ray reaches the caudal root. Pectoral with 16 rays, all but the first and last branched. Ventrals originating below pectoral axilla, their rays barely reaching the vent. Caudal too damaged for description, but Macleay said "long and forked, with the lobes produced."

Coloration, after very long preservation in alcohol, brownish, the ventrals with dusky tips. The collector (Andrew Goldie) noted the colours as "slate blue, with crimson stripe on gills, and flame colour fins and tail, the latter has a light edge. Eye green."

Described from the lectotype of *Anthias mortoni* Macleay, the largest of three specimens, 65 to 73 mm. in standard length. Austr. Mus. regd. Nos. I. 9223–9225.

Fowler made this species a synonym of *A. margaritaceus* Hilgendorf, but Macleay's types differ from Tanaka's figure [14] of that Japanese species in having smaller scales, and no produced dorsal ray. To me, it seems conspecific with *Anthias huchtii* Bleeker, figured in the "Atlas Ichthyologique." This species is not a true *Anthias*, but is referable to the genus *Franzia* Jordan and Thompson [15]. *Franzia nobilis* and *affinis*, figured by Tanaka (1921), are also allied to *huchtii*.

Chromanthias, gen. nov.

Orthotype, *Chromanthias exilis*, sp. nov.

A genus of small marine fishes superficially like the Indo-Pacific species of "*Anthias*," but differing in the following combination of characters:—

Eye subequal to interorbital; posterior orbital margin denticulated. Maxillary short, naked, with a supplemental bone. Fine teeth on jaws and palate; none on tongue. Preorbital with a row of mucus glands. Preoperculum finely denticulated on its posterior margin only; no antrorse spines. Three to four rows of cheek-scales. Gill-rakers slender and numerous. Pseudobranchiæ present.

Body covered with ciliated scales. Lateral line tubes ceasing below soft dorsal; a few pores along middle of caudal peduncle. Two or three scale-rows between lateral line and back. No squamulæ. Dorsal fins united, none of the spines produced; rays long. Anal with two spines. Pectoral rays divided, the upper ones longest. Ventrals behind pectoral base; first ventral ray long. Caudal forked. Coloration without striking bands, bars, or spots.

Readily distinguished from *Grammatonotus* Gilbert, 1905, by its fin and scale formulæ.

Chromanthias exilis, sp. nov.

Br. 4. D. xii/14; A. ii/14; P. 22; V. 1/5; C. 15. L. lat. 19 + 8 or 9 pores on caudal peduncle. L. tr. 2½/1/8½. About 33 transverse rows of scales between shoulder and hypural joint.

Head (10·5 mm.) equal to depth of body (10·5) and length of caudal fin (10·5) and 3·6 in standard length (38). Eye (3·25) subequal to interorbital (3·5), and upper jaw (3·2) and about one-third of head. Depth of caudal peduncle (4) about 2·6 in head.

General characters as defined for the genus.

Colour (in alcohol) reddish brown above and silvery below. Eye dark bluish. Dorsal fins dark brown. Other fins yellowish, the anal and caudal rather infuscated.

Described from the larger of two specimens, 35 to 38 mm. in standard length, or nearly 2 inches overall.

Locality.—Pleasant Island (Nauru), South Pacific. Holotype and paratype (Austr. Mus. regd. No. I. 6681). Though now labelled "old collection," these specimens evidently formed part of the series listed by Waite [16], who, either omitted them from his account, or else may have regarded them as *Anthias* [= *Pseudanthias*] *pleurotænia* Bleeker, which he rightly recorded from Pleasant Island at the time.

There are also specimens of a small percoid fish, included with the "*Anthias*," but too juvenile and not well enough preserved for description.

[14] Tanaka.—Fish. Japan, xxxi, 1921, p. 559, pl. cxiii, fig. 395, *as Sacura*.
[15] Jordan and Thompson.—Mem. Carnegie, Mus., vi, 4, Sept., 1914, p. 251: Orthotype, *Anthias nobilis* Franz.
[16] Waite.—Rec. Austr. Mus., v, 1903, p. 3.

Family **SPARIDAE.**

Genus **Roughleyia** Whitley, 1931.

Roughleyia palmaris, sp. nov.

(Figure 7.)

D. xii/10; A. iii/8; P. 15; V. 1/5; C. 17. L. lat. 46. L. tr. 4/1/10.

Head (80 mm.) 3, depth (100) 2·4 in standard length (240). Eye (16) 5, interorbital (26) 3, snout (22) 3·6, second anal spine (38) 2·1, depth of caudal peduncle (28) 2·8 in head.

Head somewhat higher than long; profile oblique, gibbous before eyes and at occiput. Body-profile most arched anteriorly.

Top of head scaly behind interorbital region. Five or six rows of cheek scales. Preopercular limb naked. Opercles entire. Upper jaw slightly longer than lower, the premaxillary overhung by tip of snout. Maxillary reaching to below pupil. Six anterior teeth peg-like; lateral teeth molariform, in three rows in upper jaw and two in lower. No vomerine teeth.

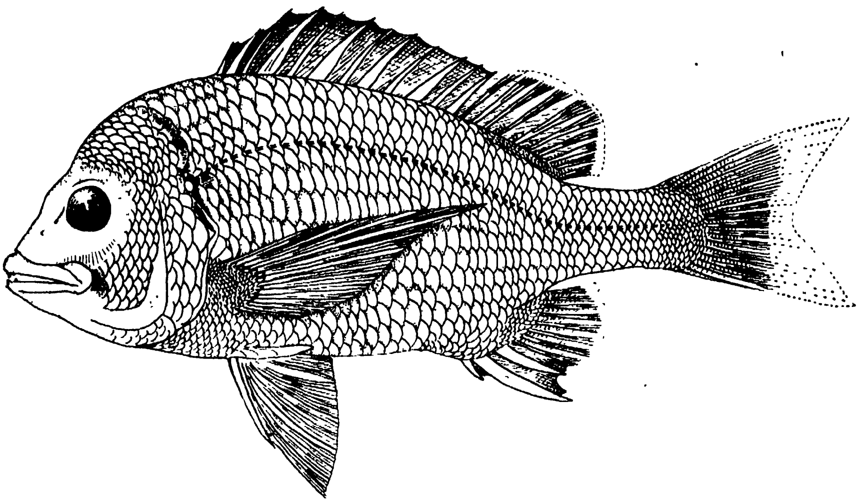

Figure 7.

Roughleyia palmaris Whitley. Holotype, 240 mm. in standard length, from Port Hedland, Western Australia. Austr. Mus. regd. No. I. 12065. G. P. Whitley *del.*

Body deep, compressed. Scales extending on to most of the fins. About four rows between lateral line and back.

Dorsal fin with twelve spines, the fourth to sixth longest, and ten rays, mostly longer than the spines. Anal with three spines (the second enlarged) and eight rays. No filamentous spines or rays.

Colour (after preservation in alcohol) olivaceous, not striped. A diffuse dark blotch just behind the maxillary. Vertical fins dusky. A dark mark at pectoral axilla and an indistinct dark blotch at upper angle of gill-opening.

Described and figured from the holotype, a specimen 240 mm. in standard length, or about 1 foot long. Austr. Mus. regd. No. I. 12065.

Locality.—Port Hedland, north-western Australia; from the Fisheries Department of Western Australia.

This new species differs from the eastern Australian genotype, *Chrysophrys australis* Gunther, 1859, in the following characters :—

A. Snout conical; upper profile almost straight. Four rows of cheek-scales. Molars in four rows in upper jaw and three in lower. D. xi–xii/11–12. Anal base terminating behind dorsal. Lateral line sinuate . . . *R. australis* (Gunther).

AA. Snout tumid, deeper; upper profile of head gibbous. Five or six rows of cheek-scales. Molars in three rows in upper jaw and two in lower. D. xii/10. Anal terminating below end of dorsal. Lateral line evenly curved . . . *R. palmaris* sp. nov.

Family **CHEILODACTYLIDAE.**

Genus **Sciaenoides** Richardson, 1843.

Sciaenoides Richardson, Rept. 12th meet. Brit. Assn. Adv. Sci., 1842 (late 1843), pp. 18 and 19. Logotype, *Sciaenoides abdominalis* Richardson *ex* Parkinson MS = *Cheilodactylus carponemus* Cuv. and Val., by present designation.

Dactylopagrus Gill, Proc. Acad. Nat. Sci. Philad. xiv, May, 1862, p. 114. Orthotype, *Cheilodactylus carponemus* Cuv. and Val. Also spelt *Dactylosparus* on p. 117.

The generic name *Sciaenoides* Richardson (not of Bleeker) takes precedence over Gill's name for the morwongs of Australia and New Zealand.

Sciaenoides morwong (Ramsay and Ogilby).

Chilodactylus morwong Ramsay and Ogilby, Proc. Linn. Soc., N. S. Wales (2), i, Nov., 1886, pp. 879 and 881. Botany Bay, N.S. Wales. Earlier, as a *nomen nudum*, in Ramsay, Cat. Exhib. N.S.W. Court, 1883, pp. 9 and 41 (Tasmania).

Dactylopagrus morwong McCulloch, Austr. Zool. Handbook, i. May 16, 1922, p. 67, and Austr. Mus. Mem. v, 1929, p. 257.

The Queensland Museum submitted for identification a fine specimen of this species, No. I. 5155 in its collection, and measuring nearly 1 foot 8 inches overall. Mr. T. C. Marshall states that it " was caught off Deep Tempest, Stradbroke Island by Mr. F. Z. Eager. Its colours in life were :—General colour pale purplish-grey spangled with bright yellow, dorsal and ventrals pale purplish-grey with yellow spots, three or four bright yellow spots below eyes and also on the operculum and preoperculum." It is one of three similar specimens.

This constitutes a new record for Queensland, this species having not hitherto been recorded from so far north.

Family **POMACENTRIDAE.**

Genus **Pseudopomacentrus** Bleeker, 1877.

Pseudopomacentrus rainfordi, sp. nov.

Br. 5. D. xiii/14; A. ii/14; P. 16; V. 1/5; C. 13. L. lat. 18 + 8. L. tr. 3/1/9.

Head (17 mm.) 3·4, depth of body (31) 1·9, depth of caudal peduncle (8·5) 6·9 in standard length (59). Snout (2) 3 in the eye (6) which is equal to interorbital (6). Pectoral (17) equal to head.

Form robust, elliptical, the profiles of the head steep and convex. Snout short and blunt. Interorbital convex. A single row of compressed incisors, with their tips well separated, in each jaw. Mandible with a sharply ascending ramus. Head scaly except on mouth, suborbital, and extreme ends of snout and chin. Bones of subocular and postocular ring very narrow, irregularly denticulated; a distinct, backwardly-curved, preocular spine. Preopercular margin strongly serrated. Operculum and interoperculum entire. A few mucus pores before the eyes. Gill-rakers long and fairly numerous.

Body covered with large ciliated scales which extend well over the bases of the unpaired fins. Axillary scales enlarged. Lateral line tubes simple, ceasing below the soft dorsal fin, where some small pores replace them and are continued along the caudal peduncle. Dorsal fin increasing in height to the seventh ray which forms the tip of a pointed lobe. Ninth anal ray longest, the fin similar to the soft dorsal. Pectorals rounded. Ventrals with produced tips which reach the anal spines. Caudal forked.

General colour fairly uniform dark chocolate brown, becoming blackish on all the fins except the pectorals which are light grey. The pectoral base is entirely covered by a black blotch, margined with white posteriorly. Allied to *P. melanopterus* Bleeker, but with increased fin-rays and tubes on lateral line, also different proportions.

Described from the holotype of the species, a specimen 59 mm. in standard length or 3 inches overall. Austr. Mus. regd. No. IA.6389.

Localities.—Hayman Island, Queensland; collected by Mr. F. A. McNeill, Christmas, 1934. Holotype and paratype. Others previously collected at the same locality by Mr. E. H. Rainford, who also obtained the species at Holbourne Island and Hook Island, Queensland. Further specimens were caught during the "Geranium" surveys of the Outer Barrier Reef between 17° S. lat. and 19° S. lat. by W. E. J. Paradice. Altogether, I have fifteen specimens from 35 to 75 mm. in standard length, or up to nearly 4 inches overall.

Family **SARDIDAE.**

Scomberomorus (Cybiosarda) elegans, subg. et. sp. nov.

D. xvi/16 + 10 finlets: A. 15 + 8 finlets.

Head (90 mm.) nearly 4, depth of body (75) 4·7 in length to end of middle caudal rays (355). Eye (10) 9, pectoral fin (44) 2·04 in head; interocular space (32) subequal to snout (32).

Upper profile of head oblique, slightly convex. Posterior nostril a lunate slit. Maxillary reaching to below posterior half of eye and overlying an oblique slit behind the rictus.

General form mackerel-like, with a high spinous dorsal fin and the body plump. A series of long, spaced, compressed teeth along each jaw. A pear-shaped patch of villiform teeth on the vomer and a spindle-shaped patch on each palatine. Broad areas of lingual teeth. Ten long, slender gill-rakers on lower part of first branchial arch.

Most of the body surface is naked, but there are small scales along the top of the back and on the caudal peduncle. Others occur along the slightly undulating course of the single lateral line, near the source of which they mingle with larger scales to form a corselet. Caudal peduncle with a keel.

Dorsal fin highest at about the fifth spine; the interdorsal space is much less than the diameter of the eye.

Head dark bluish-grey above and yellow on the sides. Body bluish-grey on the back, brownish on the flanks, and white below. Back with many small spots around spinous dorsal and with large scattered dark grey spots elsewhere; these become oblique on the sides and transformed into three or four horizontal bands. Spinous dorsal black anteriorly and white at the posterior spines. Other fins and finlets yellow, more or less suffused with dusky infuscations.

Described from a specimen in the Queensland Museum from Moreton Bay, Queensland.

Family **MULLIDAE.**

Genus **Upeneichthys** Bleeker, 1855.

Upeneichthys porosus (Cuv. and Val.).

(Plate xviii, figure 1.)

Upeneus porosus Cuvier and Valenciennes, Hist. Nat. Poiss. iii, April, 1829, p. 455. New Zealand (type) and Tasmania.

The accompanying figure was prepared by the late D. B. Fry from a specimen trawled in 20 fathoms in Spencer Gulf, South Australia. Austr. Mus. regd. No. I.10348.

Upeneus vlamingii Cuvier and Valenciennes[17] should be restricted to the East Indian fish first observed by Corneille de Vlaming and figured by Renard, as it is evidently not the same as the Southern Australian and New Zealand species, which is apparently *porosus* of the same authors, though the Sydney form was earlier named *Mullus surmuletus* var. *lineatus* by Bloch and Schneider[18].

Family **SYNAPTURIDAE.**

Genus **Phyllichthys** McCulloch, 1916.

Phyllichthys sejunctus, sp. nov.

(Plate xviii, fig. 2.)

D. 83; A. 66; V. 4; P. 7; C. 15; L.l. *circa* 96 or about 117 on blind side.

Head (32 mm.) 6·5, depth (78) 2·6 in standard length (208). Eye (5) 6·4, caudal fin (25) 1·2, interorbital (4·5) about 7 in head.

[17] Cuvier and Valenciennes.—Hist. Nat. Poiss., iii, April, 1829, p. 452.
[18] Bloch and Schneider.—Syst. Ichth., 1801, p. 78, pl. xviii, as *M. latamii*.

General habit as in *Phyllichthys punctatus* McCulloch[19], with the type of which I have compared it, but body deeper, fin-rays more numerous, head with fewer cirrhi, and slightly broader interorbital. The collector states "it was checked in life, white with gray between each square."

From the genotype, *P. sclerolepis* (Macleay) it differs in having smaller eyes. The three species, which are evidently closely related, may be distinguished as follows :—

A.—Dorsal with more than eighty, anal with more than sixty-five rays.
B.—Diameter of eye 4·6 in head ... ... *sclerolepis*.
BB.—Diameter of eye 6·4 in head ... ... *sejunctus*.
AA.—Dorsal with about seventy, anal with less than sixty-five rays.
BBB.—Diameter of eye 6·6 to 7·3 in head ... ... *punctatus*.

The holotype is a specimen, 9¼ inches long, from Fitzallen Island, Whitsunday Passage, Queensland. Presented by Mr. Melbourne Ward. Austr. Mus. regd. No. IA.6292.

Family PTERACLIDAE.

Genus Pteraclis Gronow, 1772.

Pteraclis velifer australiae, subsp. nov.

Pteraclis (*Bentenia*) sp. Whitley, Rec. Austr. Mus. xviii, 4, June 29, 1931, p. 146. New Zealand; refs. and synonymy.

An unexpected addition was made to the Australian fauna when Mr. H. Wann found a specimen of this Wing Fish washed ashore at Balmoral, Port Jackson, New South Wales, on 20 May, 1935. It is a large female, agreeing generally with my description of New Zealand specimens, but with the following characters :—Br. 8. D. 51. A. 46. P. 19. Ventrals vestigial. Head nearly 100 mm. long; depth of body nearly 120, including sheaths. Standard length, 450 mm. Eye equal to snout, 22·5 mm. Interorbital, 25. Thirteenth dorsal ray longest, about 340 mm., the tip being curved and thickened. Tenth anal ray longest, 310 mm. First and second dorsal and anal spines compressed. About fifty transverse rows of scales between upper limit of gill-opening and root of tail. A small oval patch of teeth on vomer. Austr. Mus. regd. No. IA. 6447 (type of subspecies).

Mr. Wann noted the colours as : "General colour frosty silvery, luminous in the dark. Fins dark blue, with pale turquoise spots posteriorly; eye very dark blue with a silvery iris." The fish is evidently pelagic and may have been associated with the vast quantities of salps, jellyfishes, and other floating organisms which were drifted shorewards along the coasts near Sydney in May, 1935.

The following fishes must now be added to the 630 different species found in New South Wales :—

(*a*) *Stomias affinis* Gunther, collected by the "Dana" and recorded by Ege, 1934.
(*b*) *Saccopharynx schmidti* Bertin, collected by the "Dana" and recorded by Bertin, 1934.
(*c*) *Narooma benefica* Whitley, *supra*.
(*d*) *Scalanago lateralis* Whitley, *supra*.
(*e*) *Stromateus ? maculatus* Forster, *vide supra*.

[19] McCulloch.—Mem. Qld. Mus., v, 1916, p. 67; Busselton, W.A.

(*f*) *Pteraclis velifer australiæ* Whitley, *supra*.
(*g*) *Scarus pyrrhostethus* Richardson. A specimen was recently trawled off Sydney Heads. Austr. Mus. regd. No. IA. 6429. I have also collected it at North-West Islet, Queensland, and the Austr. Mus. has Lord Howe Island specimens. Hitherto only known from tropical waters farther north.

Several new species and larval fishes still await description.

An article dealing with the commoner fishes of this State appeared in the January, 1935, number of the Australian Museum Magazine.

Family **BROTULIDAE.**

Subfamily **Dinematichyinae,** nov.

Dorsal, anal, and caudal fins separated. No barbels on head as in *Brotula*.

Genus **Dermatopsis** Ogilby, 1896.

Dermatopsis Ogilby, Proc. Linn. Soc. N. S. Wales xxi, 2, Sept. 23, 1896, p. 138. Haplotype, *D. macrodon* Ogilby. Earlier as a *nomen nudum* in Abstr. Proc. Linn. Soc. N. S. Wales, for June 24, 1896, p. ii.

Allied to *Dinematichthys* but differing in the characters of the reduced scales, dentition, and general proportions.

Dermatopsis macrodon Ogilby.

(Figure 8.)

Dermatopsis macrodon Ogilby, Proc. Linn. Soc. N. S. Wales xxi, 2, Sept. 23, 1896, p. 140. Maroubra, N. S. Wales. Holotype (No. I. 3505) in Austr. Mus., Sydney. *Id.* Ogilby, *ibid.* xxii, 1897, p. 86. *Id.* McCulloch, Austr. Zool. ii, 3, 1922, p. 115; Fish. N.S.W., 1922, p. 89; Austr. Mus. Mem. v, 1929, p. 355.

A very full and accurate description of this genus and species was given by Ogilby in 1896, but no figure has yet appeared. Whilst only one specimen was known about forty years ago, the fish is now ascertained to be fairly common at times, though practically unknown to fishermen on account of its cryptozoic habits. McCulloch (1922) described it as "A translucent, flesh-coloured fish, which lives in rock-pools on the coast. Length 3 inches." It is probably viviparous.

Amongst his manuscripts, the late A. R. McCulloch had the following note :—

"Having dissected away the flesh from the 2nd specimen referred to by Ogilby, I find the dorsal tubercles are the ends of the anterior neural spines, and are only seen when the flesh has shrunk owing to preservation in alcohol. They do not show in fresh specimens, though they can be felt when the flesh is pressed down upon them. The ventral fins are wrongly described by Ogilby being a single ray instead of two in intimate connection.

"This genus is readily distinguished from *Monothrix* by the scales being rudimentary and separate from one another instead of closely imbricate; also the maxillary is much longer than broad posteriorly instead of being as broad as long.

"A fresh specimen found on Maroubra beach is pale brown anteriorly, darker posteriorly; the dorsal caudal and anal fins very dark brown."

The present writer has collected this fish at Bottle and Glass Rocks, Port Jackson, where it lives in burrows in mud, below clumps of mussels, under stones and in suchlike shaded places. The general colour is olivaceous above, white on the belly, whilst the viscera, gills, etc., show through the skin as pinkish areas. Eye dull blue. A dark pink median streak along the body with bloodvessels also visible.

Sketches of living specimens are here reproduced to show swimming attitudes. The fish is not very active, however, preferring to hide. When brought into strong sunlight the olivaceous or dun colour changes to dull reddish brown and the fish, evidently feeling ill at ease, seeks a fresh hiding place.

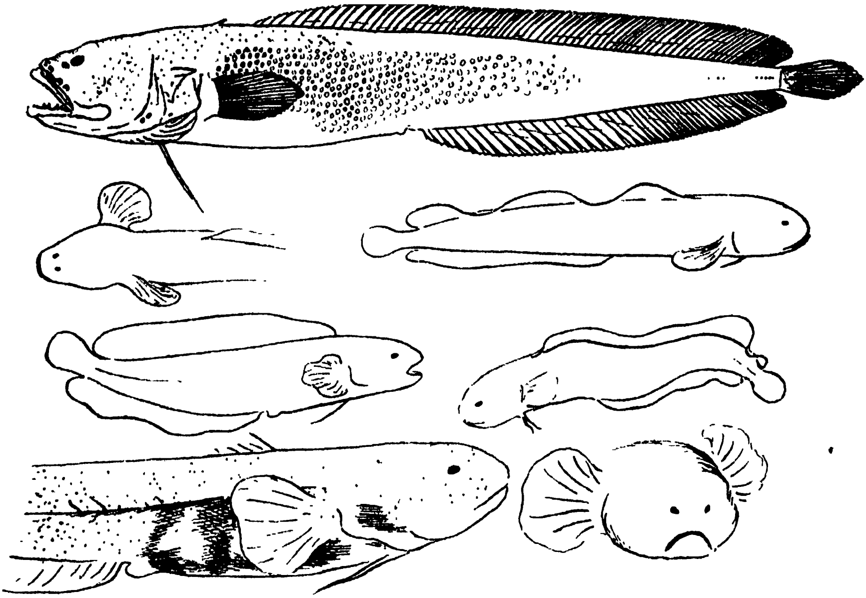

Figure 8.

Dermatopsis macrodon Ogilby. Holotype, 72 mm. in standard length, from Maroubra, N. S. Wales. Austr. Mus. regd. No. I. 3505. Also attitudes of living specimens from Bottle and Glass Rocks, Port Jackson, N. S. Wales. Austr. Mus. regd. No. IA. 5928. G. P. Whitley *del.*

The following specimens from New South Wales, are preserved in the Australian Museum :—

Registered No.	Quantity.	Locality.	Date when found.	Collector.
I. 2460	2	Bondi	1896	T. Whitelegge.
I. 3505	1 Holotype	Maroubra	July, 1896 ...	T. Whitelegge.
I. 7704 ...... *? D. macrodon*	{1 large 2 juv.}	Watson's Bay	May, 1906......	A. R. McCulloch.
I. 9016	1	Long Reef	July, 1907 ...	A. R. McCulloch.
I. 9025	1	Maroubra	? ...	T. Whitelegge.
I. 9026	1	Maroubra	? ...	T. Whitelegge.
I. 12658	1	Maroubra	Sept., 1912 ...	A. R. McCulloch.
IA. 405	1	Coogee	15 Nov., 1920	F. A. McNeill.
IA. 697	2	Coogee	Dec., 1921 ...	F. A. McNeill and A. A. Livingstone.
IA. 5800	1	Long Reef	9 May, 1933	G. P. Whitley.
IA. 5818	1	Long Reef	7 June, 1933	M. Ward.
IA. 5928	3	Bottle and Glass Rocks ...	17 Jan., 1934	G. P. Whitley.
IA. 6423	1	Bottle and Glass Rocks ...	5 March, 1935	G. P. Whitley.
IA. 6424	1	Bottle and Glass Rocks ...	5 March, 1935	G. P. Whitley.

In habits and general facies this species recalls the tropical *Dinematichthys mizolepis* which I have collected on the Great Barrier Reef, where both a pink and a yellow form are found. The habits of these apparently half-blind fishes would repay intensive study.

Genus **Monothrix** Ogilby, 1897.

Monothrix Ogilby, Proc. Linn. Soc. N. S. Wales xxii, 1, Sept. 17, 1897, p. 87. Virtual haplotype, *M. polylepis* Ogilby.

Differs from *Dermatopsis* in having more prominent eyes, fairly well developed imbricate scales, more fin rays, weaker dentition, and somewhat different proportions.

Monothrix polylepis Ogilby.

(Figure 9.)

Monothrix polylepis Ogilby, Proc. Linn. Soc. N. S. Wales xxii, 1, Sept. 17, 1897, p. 88. Maroubra N. S. Wales. Holotype (No. I. 3654) in Austr. Mus. *Id.* McCulloch, Austr. Zool. ii, 3, 1922, p. 115; Fish N.S.W., 1922, p. 89; Austr. Mus. Mem. v, 1929, p. 356.

A careful count of the fin-rays of the holotype, which is here figured, shows rather more rays than Ogilby recorded. Thus: D. 103; A. 78 (54 of them perfect, the others damaged in the type); P. 22; V. 1; C. 14. Seven branchiostegal rays. Ventrals shorter than head. The type, and one " old collection " specimen (Austr. Mus. regd. No. IA. 6133), which is smaller and unfortunately without data, are the only examples known of this interesting little species.

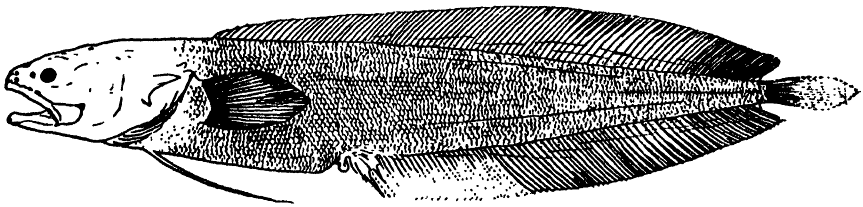

Figure 9.

Monothrix polylepis Ogilby. Holotype, 52·5 mm. in standard length, from Maroubra, N.S. Wales. Austr. Mus. regd. No. I. 3654. G. P. Whitley *del.*

Family **ELEOTRIDAE.**

Lindemanella, gen. nov.

Orthotype, *Lindemanella iota* sp. nov.

A small freshwater gudgeon, strikingly marked, the dark brown ground-colour being traversed by two broad white bands on the body, and the throat and breast white with black spots.

Head somewhat wedge-shaped, the eye intersecting the gently convex upper profile. Body compressed; caudal peduncle rather deep. Fins rounded.

Mouth large, the maxillary almost reaching to below the centre of the large eye. The lower jaw extends beyond the upper anteriorly. The tongue is large, flat, and with a rounded margin. Teeth villiform, in fairly broad bands on jaws. No large canines are present.

Snout broad. Anterior nostril in a tube overhanging the upper jaw; posterior nostril a simple aperture close to eye. Interorbital broad and flat, naked, and with a few mucus pores. No bony crests on top of head. Opercles entire, without any pungent spines. The operculum, and, to a less extent, the cheeks are scaly above, and there are faint traces of a mucus system on the lower part of the cheeks.

Gill-membranes united across isthmus. Gillrakers slender. Body rather deep and compressed, its upper profile more convex than the lower. The greatest depth of the body is just below the first dorsal fin. Body covered with rather small, imbricate, cycloid scales which do not extend on fins. The scales have raised margins with incipient denticulations. The breast appears to be naked. No lateral line. A very small anal papilla.

First dorsal fin reduced, much smaller than the second, from which it is distinctly separated. Anal opposite the soft dorsal and similar to it in form. Pectorals and caudal broadly rounded. Ventrals separate, pointed, reaching vent, and having five soft rays. The fin-rays appear simple, but may branch with age.

Coloration striking. Size small.

Differs from *Pogoneleotris* in having larger eyes and different shape and coloration.

Lindemanella iota, sp. nov.

D. vi/9; A. 9; P. 15; V. i/5; C. with 13 main rays and several smaller ones above and below. Sc. 33. L. tr. *circa* 15.

Head (6 mm.) 2·8, depth of body (4) 4·2 in standard length (17). Eye (2) greater than interorbital (1·75), which is much broader than the snout is long.

General characters as defined for the genus.

Ground colour very dark brown, becoming dark greyish on head and back. Chin, throat, and breast yellowish with large spaced blackish spots formed by large chromatophores. A broad whitish band encircles the fish at the interval between the dorsals and is widened below to include the vent and the first anal ray. Another white band encircles the caudal peduncle and there is a small saddle-shaped whitish spot immediately below the soft dorsal. The fins are whitish, more or less suffused with blackish pigment, which is particularly dense on parts of the dorsal fins.

Described from the unique holotype, a specimen 21 mm. in total length. Austr. Mus. regd. No. IA. 6411.

Locality.—Lindeman Island, North Queensland, found in a freshwater creek by Mr. Melbourne Ward in February, 1934. There is no large or constant supply of natural freshwater on the island and creeks are frequently dry, so that the presence of this fish came as a surprise.

Genus **Calleleotris** Gill, 1863.

Calleleotris strigata (Broussonet).

Gobius strigatus Broussonet, Ichthyologia, 1782, pl. 1. Tahiti (Forster).

Mr. Melbourne Ward has collected this species at Lindeman Island, Queensland. New record for Australia.

Austr. Mus. regd. No. IA. 6141.

Family GOBIIDAE.

Austrolethops, gen. nov.

Orthotype, *Austrolethops wardi*, sp. nov.

A goby with the eyes reduced in size, the head and body naked and covered with fatty skin with sensory ridges, and with the ventral fins separated.

Head bulbous, unarmed, invested with a loose skin. A row of small pores along lower part of sides of head and on chin. Eyes very small. Interorbital broad. Jaws subequal, the maxillaries reaching to below the posterior border of eye or a little beyond it. Broad bands of minute conical teeth in each jaw. Lips thick, folded. Tongue fleshy and broadly rounded. The nostrils project as short tubes. Barbels absent. Throat plicate. Gill openings wide and connected to a fairly broad isthmus. Branchiostegal membrane greatly distensible and with 3 or 4 rays embedded in its tissue on each side.

Body naked, the skin adipose and transversely wrinkled into sensory ridges. Form rather deep and compressed. Vent and anal papilla prominent. A groove runs along each side of the body where the lateral line would occur in most fishes.

Two separate dorsal fins, the first of six weak spines. Soft dorsal and anal free from caudal. Pectorals rounded, without free rays. Ventrals slender, separate, each with one spine and four rays. Caudal broadly rounded.

This curious fish is tentatively referred to the Gobiidæ, its separate ventral fins obviously being of secondary importance to the sum of its other characters and not implying Eleotrid relationships. The present form rather recalls some of the blind gobies and is doubtless a sedentary and cryptozoic creature. Its general physiognomy is superficially like that of a Brotulid, such as, for instance, *Dinematichthys*.

Austrolethops wardi, sp. nov.

(Figure 10.)

D. vi/14; A. 13; P. 16; V. i/4; C. 12.

Head (16 mm.) equal to depth of body (16) and 3·75 in standard length (60). Depth of caudal peduncle (7) 2·3, interorbital (5) 3·2, snout (3) 5·3, eye (2) 8 in head.

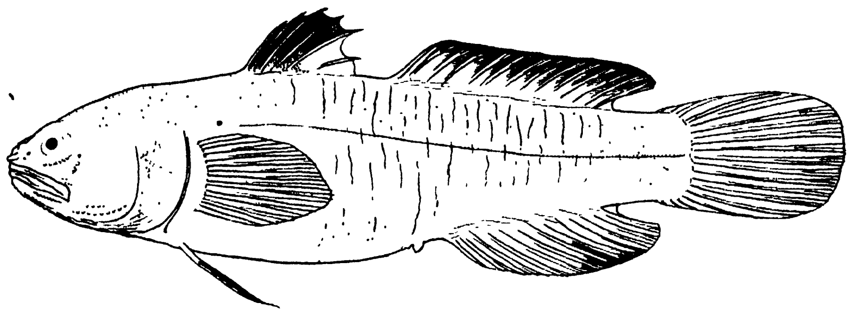

Figure 10.

Austrolethops wardi Whitley. Holotype, 60 mm. standard length, from Lindeman Island, Queensland. Austr. Mus. regd. No. IA. 6175. G. P. Whitley *del.*

Other characters as described for the genus.

General colour (in spirit) pale fleshy pink with the viscera showing bluish through the skin of the belly. Minute blackish punctulations are scattered on the upper parts of head and body. Pupil of eye blue. Inner surfaces of opercula dusky. First dorsal fin mostly black, only the posterior part being colourless. Second dorsal pale fleshy, with a broad black margin; anal similar, but with much reduced black margin. Pectorals and caudal plain. One of the ventral fins is pale yellowish with some black towards its tip; the other is plain, but it has evidently been damaged. No bands, bars, ocelli, or other striking colour-markings.

Described from the holotype of the species, a specimen 60 mm. in standard length or about 2⅜ inches overall. It is named in honour of its collector, Mr. Melbourne Ward, who forwarded it with a large collection of fishes from Lindeman Island, Queensland. The collector recalls that it was dredged from over a muddy bottom off the Boat Port Beach, Lindeman Island. Australian Museum regd. No. IA. 6175.

This new genus affords a striking parallel to the blind gobies of California, and the existence of such fishes in Australia has hitherto been unsuspected Hubbs[20] has described *Lethops connectens* which resembles the Australian form, but differs in having united ventrals. He regarded *Lethops* as intermediate in form between the normal reef gobies and the San Diego Blind Fish, *Typhlogobius californiensis* Steindachner, and stated that "the concomitant degeneration of the eye and increased differentiation of tactile organs thus marks the ontogenetic as well as the evolutionary line." The integument and its sensory papillæ and the eyes of *Typhlogobius* have been examined in detail by Ritter[21], and it may be possible to compare the Australian genus with his account when further specimens are forthcoming.

Possibly *Austrolethops* lives in darkened crustacean burrows. It is interesting to note that when fishes, even of different families or orders, adopt similar modes of life, they come to resemble one another in structure. The Brotulid fish, *Dinematichthys*[22], lives in crevices in the Queensland reefs, and the form of the head, pectoral, and ventral fins. and other parts resembles that of *Austrolethops*. Compare also *Dermatopsis* and *Monothrix* in the present paper (*Supra*, p. 239).

Family **KRAEMERIIDAE.**

Psammichthyidae Regan, Ann. Mag. Nat. Hist. (8) viii, Dec. 1, 1911, p. 733.

Genus **Kraemeria** Steindachner, 1906.

Kraemeria Steindachner, Sitzb. Akad. Wiss. Wien, cxv, 1, July 12, 1906, p. 1409. Orthotype, *K. samoensis* Steindachner; *fide* Fowler, Mem. Bish. Mus. x, 1928, p. 425.

Vitreola Jordan and Seale, Bull. U.S. Bureau Fish, xxv, Dec. 15, 1906, p. 393. Orthotype, *V. sagitta* Jordan and Seale. *Id.* Schmidt, Bull. Soc. Etudes Ocean. xvii, 1927, p. 129.

Psammichthys Regan, Trans. Linn. Soc. London xii, 1908, p. 246. Orthotype, *P. nudus* Regan. *Id.* Regan, Ann. Mag. Nat. Hist. (8) viii, 1911, p. 733.

[20] Hubbs.—Occas. Pap. Zool. Univ. Michigan, 169, 1926, p. 4, and figs.: American Naturalist, lxi, 1927, pp. 285–288, figs. a-d: California.
[21] Ritter.—Bull. Mus. Comp. Zool., xxiv, 1893, pp. 51–102, pls. i-iv.
[22] Figured by Whitley.—Rec. Austr. Mus. xvi. 1928, p. 303, fig. 2: From Port Denison.

A small, lanceolate fish with minute eyes, very prominent chin, and naked body, which lives in sand at the water's edge on tropical beaches. It has not hitherto been found in Australia.

I follow Fowler in regarding *Kraemeria* as having precedence over *Vitreola*, although Australian specimens have the dorsal fins and papillate head of *Vitreola* as described by Jordan and Seale rather than as shown in Fowler's account.

This curious genus was possibly evolved from an Oxymetopontine ancestry, becoming elongate and naked, and may have developed from a form similar to *Gignimentum*[23].

Kraemeria samoensis merensis, subsp. nov.

(Figure 11.)

D. 5/14; A. 14; P. 8; V.i/5; C. 9.

Head (9 mm.) 3·7, depth (3) about 11 in standard length (34). Depth of caudal peduncle (1·5) 6, snout (1) 9 in head. Eyes less than 1 mm. long and contiguous to one another. Total length 38 mm.

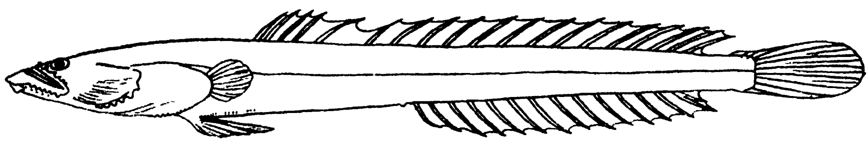

Figure 11.

Kraemeria samoensis merensis Whitley. Holotype of the subspecies, 38 mm. long, from Murray Island, Queensland. Austr. Mus. regd. No. IA. 5975. G. P. Whitley *del.*

Head acutely conical, the chin terminal. Mouth oblique, reaching to below pupil, and with a row of conic papillae above and below the jaws. Bands of fine cardiform teeth in jaws and apparently on palate too. A backwardly directed flap below chin. A row of pores below each mandible. Anterior nostrils in an upright tube; posterior nostrils are inconspicuous pores. Eyes minute, close together on top of head and visible through roof of mouth. Preoperculum radially striated, covered by skin which forms a row of papillae along its edge. Vertex of head smooth. Operculum very large, overhanging the base of the pectoral fin. Four branchiostegal rays, united by membrane to a very narrow isthmus. Gillrakers short and pointed, at least 10 on the lower portion of the first branchial arch.

Body elongated, compressed, naked. A groove runs along the middle of each side, but there appears to be no lateral line system.

Dorsal originating over end of pectoral. The first four rays are separated from the fifth, then after a further membranous gap follow fourteen rays. Anal originating below the third ray of the second dorsal. Pectorals short, rounded. Ventrals very close together but not united. Caudal with nine main rays, some of them divided. The rays are simple in the dorsal and anal fin and divided in the paired fins.

Colour (after long preservation in alcohol) brownish, the eyes dark blue. The fish was probably translucent when alive.

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[23] Whitley.—Rec. Austr. Mus., xix, 1933, p. 88.

Described and figured from the largest of fifty-six specimens, about ⅞ to 1½ inches long, from Murray Island, North Queensland, where the collector, A. R. McCulloch, noted that it "lives in sand at water's edge in company with [a crustacean] *Remipes testudineus.*"

New record for Australia.

The Australian form differs from Fowler's figure in having more pectoral rays, and resembles *Vitreola sagitta* in its papillate head, form of dorsal fins, etc. It is, however, slenderer than either, has a much shorter snout in comparison with the length of the head, and there is thus a similar disproportion in relation to the eyes. The base of the dorsal fin is about half the length of the fish. In view of these differences I name the Australian form as a new subspecies.

Family **SCORPAENIDAE.**

Subfamily **Sebastinae.**

Maxillicosta, gen. nov.

Orthotype, *Maxillicosta scabriceps* sp. nov.

A genus of Scorpion Fishes allied to *Neosebastes* (*sensu lato*), but differing in having the maxillary naked and traversed by four or five very prominent costae, instead of being scaly and without ridges; the spines on the head are also much more numerous, the pectoral fin is not evenly rounded, and there are fewer than 40 scales on the lateral line.

Maxillicosta scabriceps, sp. nov.

(Plate xviii, figs. 4 and 5.)

Br. 7. D. xii/i, 7; A. iii/5; P. 18; V. 1/5; C. 10 main rays. L. lat. about 30; L. tr.5/1/18.

Head (27) 2·3, depth (20) 3·1 in standard length (62). Eye (8) 3·3, interorbital (3) 9, snout (6) 4·5, and depth of caudal peduncle (6) 4·5 in head.

Head bluntly rounded, exceedingly spiny. Supraorbital spines short, not overhanging eye. Interorbital deeply grooved. Eye large. A broad, naked, sunken area on occiput. Preorbital stay with many recumbent spines, which are not hooked. Interoperculum naked; rest of the opercles scaly. Maxillary broad, its truncate posterior margin equal to half the eye-diameter, and just reaching the posterior half of the eye. It is naked and crossed by several strong oblique ribs. Bands of very fine teeth in jaws, on vomer, along palatines and on tongue.

Gillrakers spaced, slender above and stumpy below; seven on the lower part of the first branchial arch. They are short and thick on the succeeding arches.

Body robust, tapering to the caudal fin, and covered with loose cycloid scales with rather pyriform margins. The course of the lateral line is marked by indistinct ridges. No fleshy flaps.

Dorsal commencing well forward, its fourth spine longest and higher than any of the rays. Second anal spine longer than the others and subequal to some of the anal rays. Last ray in dorsal and anal fins split to base. Upper pectoral rays much longer than the lower ones; only a few of the longest rays are divided. No detached feeler-like rays. Second and third ventral rays longest, but not reaching the vent. Caudal truncate.

Colour (after long preservation) straw-yellowish. A series of five short indistinct dusky bars on each side of the dorsal fins and some dusky blotches along sides. Some orange on the sunken areas of the head. Eyes blue. A large black blotch between the fourth and eighth dorsal spines; rest of fins yellowish.

Described from the holotype of the species, a specimen 62 mm. in standard length or about 3 inches overall. Two paratypes are a few millimetres longer and show unimportant variation in the spines on the head.

Localities.—Kingscote, Kangaroo Island, South Australia; 22 Feb., 1920. Collected by Ellis Le Geyt Troughton. Holotype, Austr. Mus. regd. No. IA. 21.

Fifty miles south of Cape Wiles, South Australia; 75 fathoms, 29 August, 1909. F.I.V. "Endeavour" coll. Regd. No. E. 988 (paratype).

Off Flinders Island, South Australia; 37 fathoms, 30 August, 1909. F.I.V. "Endeavour" coll. Regd. No. I. 10404 (paratype).

Family **PLATYCEPHALIDAE.**

Genus **Neoplatycephalus** Castelnau, 1872.

Neoplatycephalus speculator Klunzinger.

(Plate xviii, fig. 6.)

Platycephalus speculator Klunzinger, Arch. Naturg. xxxviii, 1, 1872, p. 28. Hobson's Bay, Victoria. *Id.* Klunzinger, Sitzb. K. Akad. Wiss. Wien lxxx, 1, 1879, p. 367, pl. iv, fig. 1. *Id.* Macleay, Proc. Linn. Soc. N. S. Wales, ix, 1884, p. 30.

Neoplatycephalus grandis Castelnau, Proc. Zool. Acclim. Soc. Vict. i, July 15, 1872, p. 87. Melbourne Market.

Cacumen speculator Whitley, Austr. Zool. vi, 1931, p. 326.

D. i/vii/i, 12 (13); A. 14; P. 20; V. i/5; C. 11. L. lat. 80 from shoulder to hypural joint. L. tr. 13/1/28 from origin of dorsal to that of anal.

Head about 130 mm. broad and 195 long and thus nearly 2·8 in standard length (545). Depth of body (65) nearly 8·4 in the same. Eye (32) 6, interorbital (29) 6·7, snout (58) 3·36, postorbital length (106) 1·8, second dorsal spine (75) 2·6, pectoral (82) 2·37, ventral (122) 1·6, depth of caudal peduncle (21) 9·3, lower preopercular spine (18) 10·8 in the head, measured obliquely from tip of upper jaw to opercular flap.

Form elongate, depressed, the upper profile gently rounded. Head broad and flattened. Eyes very large and separated by a broad concave interorbital which is wider than the transverse diameter of either eye. Anterior nostril a small opening, with a prominent flap; posterior nostril an oblique slit. Top of head with weak bony ridges, converging slightly on the occiput. Most of the head is scaly above, but the cheeks, chin, and much of the preorbital are naked. Preocular spine almost obsolete. Each cheek with seven to ten striae radiating from the suborbital stay. Preoperculum with the lower spine more than twice as long and thick as the upper. Two strong opercular spines and a broad flap. Gill-membranes overlapping over the isthmus. Pseudobranchiae present. About nineteen spinose gillrakers on first branchial arch, though they become rudimentary anteriorly, only a few near the angle being developed as peg-like processes. Six branchiostegal rays can be discerned through the thick adipose tissue investing them. Mouth large, the maxillaries extending to below anterior half of eye. The lower jaw is the longer and has the lip very thick and broadened laterally to form a kind of inverted distensible pouch.

The premaxillary processes reach to the level of the anterior nostrils and the premaxillaries themselves extend far back, being overhung by the extensible upper lip and intermaxillary membranes.

A patch of coarse cardiform teeth, a few of them like small canines, occurs at the mandibular symphysis and on either side of the premaxillary symphysis. An outer band of villiform teeth in each jaw, although in the lower jaw a row of cardiform teeth is present amongst the villiform ones. A few acute teeth on the vomer. Each palatine well armed with cardiform and caniniform teeth in a single row and interspersed with villiform ones.

Tongue large, flat, toothless and with the tip truncate.

Body robust, broadest and deepest anteriorly, and covered with large, regular ciliated scales with regularly spaced circuli and irregular radiating basal striae. These scales do not extend on the fins, except along the caudal rays, and only form a weak ridge along the lateral line.

First dorsal spine originating a little behind the head and separate from the others. The soft dorsal fin originates a trifle before the origin of the anal and ends well before the anal termination. Pectorals small; inner ventral rays very long, reaching to anal fin. Caudal bluntly rounded.

Colour (in formalin) olive brown above and white below. Each scale has a light pearly centre, bounded by its brownish margin. Eye dull milky bluish, the iris surrounded by a golden ring. Lower lip fuscous towards the chin. Dorsal fins hyaline. Anal rays smoky towards their bases. Some smoky brown streaks on the pectorals and ventrals. Caudal with an inconspicuous smoky band along the lower lobe, below which the fin is whitish.

Described from a specimen 545 mm. in standard length, or a little over 2 feet in total length.

Locality.—80 miles south-west from Cape Everard, Victoria; 45 fathoms. Collected and presented by Captain K. Moller. Austr. Mus. regd. No. IA. 6132.

This large flathead was immediately distinguished by its collector by means of its large scales, and uniform coloration. It appears to be determinable as *Platycephalus speculator* Klunzinger or *Neoplatycephalus grandis* Castelnau, both of which names were published in the same year. Fortunately, Gunther[24] definitely recorded that Klunzinger's paper had precedence of date over Castelnau's, so *speculator* is evidently the name to be used.

My specimen is described because it differs in minor details from published descriptions, yet indicates that *Cacumen* and *Neoplatycephalus* are synonyms. The question next arises as to whether *Neoplatycephalus* can still be used for the Tiger Flathead of Eastern Australia, described as *Platycephalus macrodon* by Ogilby. I have compared Ogilby's type and other examples of *macrodon* with the described specimen of *speculator*, but do not regard the differences as of generic but only of subgeneric importance. Key to the species:—

A.—Width of interorbital less than that of eye. Preorbital spines obsolescent. A series of radiating ridges over suborbital stay, behind eye. Nineteen gill-rakers on lower limb of first gill-arch. Lower preopercular spine much longer than upper. Pectorals shorter than postorbital portion of head. Colour olivaceous, each scale with a light centre. Length over 2 feet . . . *Neoplatycephalus* (*Neoplatycephalus*) *speculator*.

[24] Gunther.—Zool. Rec., ix, 1872 (publ. 1874), p. 85.

AA.—Width of interorbital subequal to that of eye. Preorbital spines prominent. No series of radiating ridges over suborbital stay. Twelve gill-rakers on lower limb of first gill-arch. Lower preopercular spine not much longer than upper. Pectorals almost equal to postorbital. Coloration brownish with red spots. Length less than 2 feet, usually nearer 1 foot long. . . *Neoplatycephalus* (*Colefaxia*) *macrodon.*

The new subgeneric name *Colefaxia* is proposed for *Platycephalus macrodon* Ogilby, mainly on the structure of the gill-rakers and preopercular spines. Although the scales of this form appear smaller than in *speculator*, actual counts reveal very little difference.

Named in honour of Mr. A. N. Colefax, B.Sc., of the University of Sydney, who is investigating the habits, economics, anatomy, and other features of the Tiger Flathead, the first fruits of which investigation have recently been published[25].

Family **TETRABRACHIIDAE.**

Genus **Tetrabrachium** Gunther, 1880.

Tetrabrachium ocellatum Gunther.

Tetrabrachium ocellatum Gunther, Rept. Voy. Challenger, Zool. i, 6, 1880, p. 45, pl. xix, fig. C. South of New Guinea; station 188; 28 fathoms. *Id.* Whitley, Abstr. Proc. Linn. Soc. N. S. Wales, April, 1934.

One specimen of this remarkable little Angler Fish was dredged in 5 fathoms off Hayman Island by Mr. F. A. McNeill. Australian Museum regd. No. IA. 6003. Mr. Melbourne Ward has collected another specimen at Lindeman Island (No. IA. 6136).

These Queensland records entitle this species to recognition as a member of the Australian fauna.

New Generic Names.

The following new generic names are proposed to replace others which are preoccupied :—

Ansorgiichthys (fam. Schilbeidae) for *Ansorgia* Boulenger, 1912, not of Warren, 1899, a genus of moths. Type, *Ansorgia vittata* Boulenger = *Ansorgiichthys vittatus.*

Arambourgia (fam. Chilodipteridae) for *Apogonoides* Arambourg, 1927, not of Bleeker, 1849, another fish genus. Type, *A. cottreaui* Arambourg.

Apostasella (fam. Acanthuridae) for *Apostasis* Kramberger, 1891, non Lendenfeld, 1885, a genus of Hydrozoa. Type, *Acanus gaudryi* Kramberger = *Apostasella gaudryi.*

Protosiganus (fam. Amphacanthidae) for *Archaeoteuthis* Wettstein, 1887, not of Brown and Roemer, 1856, another genus of fishes. Type, *A. glaronensis* Wettstein = *Protosiganus glaronensis.*

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[25] Dakin.—Austr. Zool., vii, 1931, p. 26, pl. i and text, fig. 3; A.N.Z. A.A.S Handbook, N.S.W., 1932, p. 94; Dakin and Colefax—Proc. Linn. Soc. N.S.W., lviii, 1933, p. 210; Colefax—Proc. Linn. Soc. N.S.W., lix, 1934, pp. 71–91, 9 figs.; and Dakin—Proc. Roy. Soc. Tasm., 1934 (1935), p. 11, fig. 1.

Borodamirus (fam. Eleotridae) for *Callieleotris* Fowler, 1934, not *Calleleotris* Gill, 1863, in the same family. Type, *C. platycephalus* Fowler = *Borodamirus platycephalus*.

Zosterisessor (fam. Gobiidae) for *Zostericola* Iljin, 1927, not of Ashby, 1919, a genus of Loricate Mollusca. Type, *Gobius ophiocephalus* Pallas = *Z. ophiocephalus*.

Evenichthys (fam. Characinidae) for *Aequidens*, Steindachner, 1915, preoccupied by Eigenmann and Bray, 1894, another fish genus. Type, *Tetragonopterus fasslii* Steindachner = *Evenichthys fasslii*.

EXPLANATION OF PLATES AND FIGURES.

Plate XVIII.

Fig. 1.—*Upeneichthys porosus* (Cuvier and Valenciennes). A specimen, 8½ inches long, from Spencer Gulf, South Australia. Austr. Mus. regd. No. I. 10348.

Fig. 2.—*Phyllichthys sejunctus* Whitley. Holotype, 9¼ inches long, from Fitzallen Island, Queensland. Austr. Mus. regd. No. IA. 6292.

Fig. 3.—*Fraudella carassiops* Whitley. Holotype, 45 mm. standard length, from North-West Islet, Queensland. Austr. Mus. regd. No. IA. 5093.

Fig. 4.—*Maxillicosta scabriceps* Whitley. Holotype, 62 mm. standard length, from Kangaroo Island, South Australia. Austr. Mus. regd. No. IA. 21.

Fig. 5.—*Maxillicosta scabriceps* Whitley. Head of holotype, showing the ridges on the maxillary.

Fig. 6.—*Neoplatycephalus speculator* Klunzinger. A specimen, 545 mm. standard length, from off Cape Everard, Victoria. Austr. Mus. regd. No. IA. 6132.

FIVE NEW RATS OF THE GENERA HYDROMYS AND MELOMYS FROM NORTHERN AUSTRALIA.

By

ELLIS LE G. TROUGHTON.

Zoologist, Australian Museum.

(Figures 1–2.)

As a result of encouraging volunteer collectors by the provision of instructions and gear, and the personal efforts of Museum workers on the rare opportunities afforded for field work, the acquisition of indigenous mammals has shown a marked increase over the past fifteen years. New forms of marsupials, rodents, and bats are occasionally identified, and opportunities must be sought for the preparation of papers dealing with as many species as possible in order to close up the gaps and aid in working out the zoo-geographical relationships of the unique mammalian fauna.

Of the five new forms described here, one species of *Hydromys* was collected by the author on Lawn Hill Creek, about 100 miles south of Burketown, which is in the Gulf country of north-western Queensland, while an interesting new *Melomys* was secured by a colleague, Mr. F. A. McNeill, when on vacation at Hayman Island in the Whitsunday Group on the north-eastern coast of that State.

The submission of various kinds of mammals for identification regarding economic and health matters is another source of interesting material. In connection with the investigation of Weil's Disease in the cane fields of north Queensland, over a hundred specimens of rats have been submitted for examination by Sir Raphael Cilento, Director-General of Public Health in that State, and Professor Harvey Sutton of Sydney University, amongst which were five specimens of the previously little known *Melomys littoralis*, providing the extension of range noted below from the Cairns district 260 miles southward to Ayr.

The value of voluntary field activities, however, is strikingly shown by several small collections received from Groote Eylandt off the western and rather hostile shore of the Gulf of Carpentaria. The first mammals were collected by Sir Hubert (then Captain) Wilkins for the British Museum (Natural History), which financed the expedition, resulting in the description of new species not represented in an Australian Museum. A few years later, by the kindly interest and efforts of the late Rev. H. E. Warren between 1928–1930, supplemented by those of his successor at the Groote Eylandt Mission Station, Mr. H. L. Perriman, a representative series of mammals was received in the Museum containers, including not only described species, but also a strikingly new species of *Hydromys*, and a new *Melomys* as well. A new *Hydromys* from Moa or Banks Island, Torres Strait, is here added to the long series of important donations received as a result of the very active interest in the indigenous mammalian fauna shown by Mr. A. S. Le Souef, C.M.Z.S., Curator of Taronga Zoological Park.

In expressing appreciation of the efforts of past and present voluntary collectors, one may appropriately pay tribute of sincere regret at the tragic passing of the Reverend H. E. Warren, in the Bass Strait air disaster of 1934, from the band of willing helpers in fields beyond one's reach.

The text figures were kindly prepared by my colleague, Miss Joyce K. Allan, Assistant Conchologist to the Australian Museum.

Hydromys grootensis sp. nov.

Diagnosis.—A strikingly distinct large-footed insular species, distinguished from all known members of the genus by its general amber-toned coloration, and unusually broad fleshy hindfeet, which are also very stoutly clawed. Cranially distinguished by having the smallest adult upper molar series coupled with unusually heavy incisors and zygomatic arches, large nasals, and the largest palatal foramina known in the genus. Habitat: Groote Eylandt, Gulf of Carpentaria.

Colour.—Remarkable for its yellowish-brown colouration, which lacks the grey or black elements of other species and might be regarded as generally amber in tone. Above, compared with Ridgway's colour chart, the darkest shade is provided by the chestnut-brown tipping of the longer hairs, which tends to form a darker dorsal line extending from the nose-tip to the tail-base. Intermixed with the dark tipping is the shining light cinnamon-brown to tawny tipping of the softer pile, and the whole upper surface, excepting the head, is grizzled with pinkish-buff hairs, which predominate on the sides, giving them a clear colouration. Basal fur of back unusually pale, about drab grey. Below, the pinkish-buff tipping becomes richer and imparts a warm buffy wash to the cartridge-buff tone of the hair-tips; basal fur a very light drab-grey. Manus and pes sayal to snuff-brown with a mingling of shining buffy hairs. Tail with the light tip unusually short, covered with coarse dark chestnut-brown hairs to within an inch of the tip which becomes yellowish white. The short fur of the head and muzzle of a less grizzled cinnamon to chestnut-brown, and there are light buffy patches on the cheeks behind the eyes.

Figure 1.

Left hindfoot of *Hydromys grootensis* sp. nov., showing the unusually heavy structure and breadth, short stout claws, enlarged and coarsely granulated interdigital pads, and remarkably elongated hallucal pad.

External Characters.—Hindfoot remarkably broad and thick with short fleshy digits, and enlarged and heavily granulated pads, the hallucal being specially elongate (Figure 1), and the claws unusually stout.

Skull and Dentition.—Skull stoutly built, with unusually heavy zygomatic arches, and large nasals, which are placed farther back than usual, the tips being actually behind the rear edge of the incisors and the tapered posterior ends extending much farther into the interorbital region than in other forms. Palatal foramina longer and wider than those of *H. chrysogaster* and therefore the largest known for the genus. Upper molar series smallest of the genus, but incisors longer and stouter than those of adjacent mainland species, second only to those of *chrysogaster* in size.

Dimensions of Holotype, Male.—Wet skin: head and body about 305; tail 240; hindfoot, length 63·5, breadth at base of 1st–5th digits 19·5; ear about 18 mm.

Skull: Incomplete basally; nasals, length 19·4, greatest breadth 5·7; interorbital width 7; palatal foramina 7·2 × 3·8; upper molar row 7·8; breadth of 1st upper molar 2·9.

Habitat.—Groote Eylandt, off the west coast of the Gulf of Carpentaria.

Holotype.—Adult male, No. M. 4476 in the Australian Museum collection. Collected and presented in 1928 by the late Reverend H. E. Warren.

Remarks.—The comparatively large incisors coupled with the smallness of the molars, and the remarkable stoutness of the hindfeet with their enlarged and more rugose pads and blunter claws are such as to suggest a marked difference in habits due to the animal's insular habitat. The specific name is therefore associated with the island to simplify consideration of the geographical distribution of members of the genus.

Hydromys lawnensis sp. nov.

Diagnosis.—A medium-sized buffy grey species, distinguished from all others of the genus in having the tail definitely longer than the head and body in both sexes. Also characterized by the comparatively great length of the hindfoot, which in the adult holotype is only 1 mm. less than that of the much larger *H. chrysogaster reginæ* holotype, and considerably longer than the hindfeet of *H. longmani*, which has a greater head and body length. The upper molar series is the longest known for the genus. Fur finer than in *H. longmani* and a clearer more buffy grey above, lacking the heavy black pencilling of the back of that species. Habitat: Lawn Hill Creek, north-western Queensland.

Colour.—General colour of back grizzled greyish to buffy brown, which is clearest on the nape, shoulders, and upper back, the pencilling of blackish hairs being closest on the top of the snout, head, and lower back. Light tipping of fur ranging from pinkish to cinnamon-buff. The sides becoming clearer greyish buff which merges into the pinkish buff tipping of the belly fur. Basal fur above about pale neutral grey; below much paler, almost pallid neutral grey. Manus shining mummy-brown, the dark colour contrasting markedly with the buffy-grey limb. Pes with a dark prout's brown outer edge, the rest of the surface paler, more buffy brown. Basal two-thirds of tail blackish brown, the final third white.

External Characters.—The tail is definitely longer than the head and body in bot sexes, instead of being shorter as in all other species of the genus. Hindfoot proportionately very long, measuring 65 mm. in the adult male holotype, with a total length of 535 mm., compared with the 66 mm. pes of the type of *H. chrysogaster reginæ* with a head and body length of 656 mm.

Skull and Dentition.—Interorbital constriction comparatively rather broad and the adult male palatal foramina exceeding the length of those of *H. longmani*. Upper molar series apparently the largest of the genus, the length of the row, and possibly the width of m^1, exceeding that of the much larger *chrysogaster reginæ*.

Dimensions of Holotype, Adult Male.—Fresh specimen: head and body 259; tail 276; hindfoot, length 65, breadth at base of 1st–5th digits 17·5; ear 18·5 mm.

Skull: greatest length 54·2; basal length 49·6; zygomatic breadth 26·2; nasals 18·7 × 5·5; interorbital width 7·1; palatilar length 25·1; palatal foramina 6·5 × 3·4; upper molar row 9·3; breadth of m^1 3·1 mm.

Habitat.—Lawn Hill Creek in north-western Queensland, near the border of the Northern Territory which it actually crosses. Holotype and allotype from Adel's Grove about 12 miles south of Lawn Hill Station and about 100 miles south of Burketown.

Type Specimens.—Holotype, adult male, No. M. 5650; allotype, young female, M. 5651, in the Australian Museum. Collected by E. Le G. Troughton, 16th June, 1934.

Remarks.—The discovery of this well defined species in a locality intermediate between that of *longmani* of the Atherton Tableland in the east, and *caurinus* of the East Kimberley region of the north-west, is of interest in bridging a wide break in generic distribution, because of which the specific name has been associated with the habitat. The proportionately greater tail and hindfoot length, and longer upper molar row, specifically distinguish this animal from both these nearest known mainland species, quite apart from the differences in colour.

Hydromys moae sp. nov.

Diagnosis.—A small-bodied, relatively large-skulled insular species, differing from the north Queensland *H. chrysogaster reginæ* and *longmani* in dimensions and coloration. Distinguished from *H. esox*, the most adjacent Papuan species, in general proportions, cranially, and in lacking the black head markings and buffy whitish manus and pes of that species. Habitat: Moa or Banks Island, Torres Strait.

Colour.—General tone of the back sepia, composed of the soft prout's brown tipping of the fur, variegated and intensified in parts by the intermingling of ochraceous-buff to ochraceous-tawny and the shining blackish seal-brown longer hairs. Top of head, from snout-tip to behind ears, a light seal-brown, softly flecked with buffy tips. Sides of body a clearer buffy sepia owing to the natural reduction of the darker tipping, but the cheeks and edge of belly with a strong ochraceous-buff wash. Manus pale prout's brown. Pes with an outer edging of pale prout's brown continued from the leg, remainder of surface more buffy. Undersurface a greyish pale buffy, sprinkled with shining light ochraceous-buffy hairs. Tail with slightly over the final fourth white, about the basal three-fourths seal-brown above, paler below.

External Characters.—Hindfoot comparatively long and slender, twisted as in typical *Hydromys*, with webbing well developed, and usual slender arched claws, not short and stout as in *grootensis*. Foot and ear proportionately much larger than in *esox*, the foot being about as in *longmani* but other dimensions smaller, much smaller altogether than *chrysogaster reginæ*. Tail proportionately rather short, only exceeding that of *melicertes*, which has a smaller foot, and a little shorter than that of *esox* with a much smaller foot.

Skull and Dentition.—Distinguished by having the smallest palatal foramina known for the genus, while the interorbital constriction is also narrower than that of the small Papuan *esox*, or the north Queensland *longmani*. Skull narrower generally than in *longmani*, but the nasals slightly longer and wider, therefore much longer than in *esox* and differing in having the tips above the front edge of the incisors, while their hinder borders extend well back into the frontal region. Molars comparatively large and heavy, slightly more so than in *longmani*, much as in southern *chrysogaster* but smaller than *reginæ*, larger than in *esox*.

Dimensions of Holotype.—Dry skin, doubtful sex: tail about 220; hindfoot, length 58, breadth at base of 1st-5th digits 16; ear 18 mm.

Skull: greatest length 52·7; basal length 48: zygomatic breadth 24; nasals 18·6 × 5·5; interorbital width 6·4; palatilar length 24·5; palatal foramina 4·7 × 2·8; upper molar row 8·5; breadth of 1st upper molar 3 mm.

Habitat.—Moa or Banks Island, Torres Strait, as far as at present known.

Holotype.—Skin and skull of adult No. M. 4558 in the Australian Museum collection; paratype immature skin and skull No. M. 4559. Presented in April, 1929, by Mr. A. S. Le Souef, C.M.Z.S., Curator of the Taronga Zoological Park.

Remarks.—This well defined island species, in common with other insular forms, has a comparatively large skull in relation to the moderate body and tail proportions. Apart from the small palatal foramina and interorbital width, which apparently distinguish it from all known species of *Hydromys*, it lacks the generally sombre brown coloration of *beccarii* of Key Island and New Guinea, and has a larger hindfoot, and only one quarter instead of two-thirds of the tail is white; it also lacks the dark head markings described for *esox*, and has larger feet, which are darker in colour.

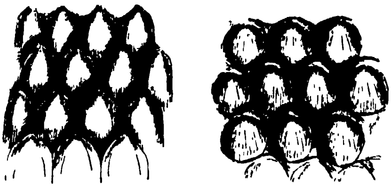
Melomys limicauda sp. nov.

Diagnosis.—Most nearly allied with *M. rubicola* from Bramble Cay, Torres Straits, in the proportionately long and rugose tail, which is, however, relatively not so long and is much more coarsely scaled. Differing markedly in the much longer and wider ear, and in having an entirely white throat, chest, and inguinal region, and shorter and broader hindfeet. The skull, apart from the relatively stouter build and greater breadth, which is most marked in the rostral and cranial region, is distinguished from that of *rubicola* by the much larger bullæ. Habitat: Hayman Island, Whitsunday Group, Queensland.

Colour.—Generally similar but decidedly paler throughout than in *rubicola*, notably lacking the rich tawny wash which extends along the back of that species from crown to rump. Undersurface definitely paler, the fur entirely ivory white on the throat, chest, centre of belly, and inguinal region. On the back the general colour is a buffy saval brown softly pencilled with the darker brown of the fur-tips, the crown and rump brighter. Cheeks, sides of body, and limbs of a clearer greyish brown washed with avellaneous. Manus and pes white-haired, the manus with a slight line of darker hairs extending across the wrist to the outer edge, the mark much narrower than in *rubicola*. Tail dark brown above, lighter below.

External Characters.—Tail of adult male holotype proportionately much shorter than in males of *rubicola*, but much as in females of that species, measurements of the Museum series of *rubicola* suggesting that only males are characterized by the unusually long tail; no doubt females of *limicauda* when available will also show a relative reduction of tail-length and prove that a relatively shorter tail is

characteristic of the species. Tail covering coarser grained and more rugose, the individual scales (Figure 2) more globose or inflated, more crowded, elongate, and overlapping than in *rubicola* so that they do not tend to form such well-defined rings. Hindfoot much the same in general appearance, but decidedly shorter and broader, with larger or more inflated pads. Ear much larger and more leaf-like, being considerably longer and wider, reaching about the centre of the eye when pressed forward, instead of not nearly reaching to the posterior canthus as in *rubicola*. Pelage rather longer and sparser than in *rubicola*, averaging about 16 against 13 mm. in length on the middle of the back.



a *b*

Figure 2.

Showing (*a*) the coarser, more inflated and elongate overlapping tail-scales of *Melomys limicauda* sp. nov., in comparison with (*b*) the less rugose and more rounded ones of *Melomys rubicola* Thomas.

Skull and Dentition.—Skull decidedly broader and more stoutly built than that of an adult male *rubicola* of greater head and body length, the difference in breadth being marked in the rostral region and wider palatal foramina. The tympanic bullæ differ markedly in their greater size and breadth, being 5·7 in greatest length by 6·2 mm., against 5 by 5·3 mm. wide in *rubicola*.

Dimensions of Holotype, Old Male.—In spirit: head and body 155; tail 165; hindfoot 31·5, breadth at base of 1st-5th digits 9·5; ear, length 19, greatest breadth 17·5 mm.

Skull: greatest length 40·3; basal length 35·8; zygomatic breadth 21; nasals 13·7 × 4·3; interorbital width about 6; palatilar length 18; palatal foramina 6·5 × 2·6; upper molar row 6·4; breadth of m^1 2 mm.

Habitat.—Hayman Island in the Whitsunday Group, on the north Queensland coast between Bowen and Mackay.

Holotype.—Old male, No. M. 5928 in the Australian Museum collection. Collected in January, 1935, by Mr. F. A. McNeill, Invertebrate Zoologist to the Museum, while on vacation at the island.

Remarks.—This very distinct species is readily distinguished from its closest though geographically distant ally by its larger ears and bullæ, as well as by the much coarser rasp- or file-like appearance of the tail, to which the specific name refers; the latter feature, of course, distinguishing the animal from the widely distributed *M. cervinipes* of the mainland and *M. banfieldi* of Dunk Island. According to its collector, the interesting species was attracted to the camp buildings, where it disregarded such foods as butter and meats and favoured desiccated coconut and dried fruits more in accordance with the natural diet. An immature female was recently received from Mr. Hans Kroyer, who has since obtained an adult specimen to be forwarded when fully preserved.

It seems evident that the marked specific distinctions, such as the larger ears, correlated with enlarged bullæ, and the more pronounced foot-pads and coarser scaling of the tail, which are probably of assistance in climbing, are features developed in accordance with the rugged and more varied conditions of Hayman Island, in contrast with the restricted low-lying sandy area of Bramble Cay. The warmer coloration of the Museum series of *rubicola* collected by the late Charles Hedley, F.L.S., in September, 1924, appears to contrast with the description by Oldfield Thomas of his holotype collected in 1845 by John Macgillivray during the voyage of H.M.S. "Fly." The fur of the undersurface in recent specimens is grey-based throughout and buff-tipped, contrasting strongly with the present species, and suggesting that the original series of *rubicola* had faded in long preservation.

Melomys mixtus sp. nov.

Diagnosis.—A small form, intermediate in various cranial and external features between *australius* and *murinus*. Differing from the former in its definitely longer hindfoot, shorter ear, colour of belly, somewhat wider interorbital region, shorter palatal foramina, and longer upper molar row. The geographically more distant insular *murinus* agrees in foot-length but has a decidedly longer ear, and relatively larger skull, though the upper molar row is actually smaller. Habitat: Groote Eylandt, Gulf of Carpentaria.

Colour.—Apparently brighter above than in *australius*, being definitely richer than the buffy-brown described for that species, and with a more sharply defined whitish undersurface as described for *murinus*. General tone of back about cinnamon-brown composed of the ochraceous-tawny and prout's brown tipping of the fur. Cheeks, limbs, and sides clearer ochraceous brown owing to the reduction of dark pencilling and a wash of cinnamon. Hairs on manus and pes light buff, a dark line extending from the forearm along the outer edge of manus to the base of the second digit. Tail about prout's brown above, paler below.

External Characters.—As indicated in the diagnosis, the dimensions are somewhat intermediate, the hindfoot in both sexes being definitely larger than in *australius*, much as in *murinus*, but the ear actually shorter than in both allies.

Skull and Dentition.—The skull agrees in general proportions with *australius*, but differs in having a decidedly longer molar row, while the palatal foramina are shorter and the interorbital width is greater. The molar row is larger, the palatal foramina shorter, and the interorbital width equal to or even comparatively larger than in the proportionately stouter skull of *murinus*.

Dimensions of Holotype.—Adult male (in alcohol): head and body 105; tail 111; hindfoot, length 25, breadth at base of 1st-5th digits 5·7; ear 13·5 mm.

Skull: greatest length 28·6; basal length 24·4; zygomatic breadth 15·2: nasals 10·1 × 3·4; interorbital width 4·8; breadth of brain-case 13; palatal foramina 4·5 × 2; upper molar row 5·5; breadth of m^1 1·6 mm.

Habitat.—Groote Eylandt, on the west coast of the Gulf of Carpentaria.

Type Specimens.—In the Australian Museum collection: Holotype, adult male, No. M. 5397, collected and presented by Mr. H. L. Perriman in 1933; allotype, young female, collected and presented by the late Rev. H. E. Warren in 1930.

Remarks.—Although Oldfield Thomas considered it possible that all the small forms of *Melomys* from each side of Torres Strait and the islands between might later be regarded as sub-species of the one variable animal, it would be difficult to reconcile specifically the mixed features of this island form with its nearest known mainland or insular allies.

When examining the typical series of Murinae in the British Museum (Natural History) I noted of *M. australius* that the warm buff of the sides continues over the belly, almost reproducing the ochraceous buffy tone of the belly of *M. lutrillus*, thus indicating that the undersurface of *australius* is definitely darker than the contrasting underparts of the new form.

Melomys littoralis Lonnberg.

This medium-sized species of coastal north Queensland has hitherto been known only from the original female and young collected on the beach near the mouth of the Russell River a little north of Cairns, described by Professor Lonnberg[1] in 1916, and the subspecies from Hinchinbrook Island, *M. littoralis insulæ*, described by Troughton and Le Souef[2] in 1929.

During the examination of more than a hundred rats recently submitted for identification by Sir Raphael Cilento, Director-General of Public Health in Queensland, and Professor Harvey Sutton of the School of Public Health and Tropical Medicine at Sydney University, in connection with their investigation of the occurrence of Weil's Disease in the Queensland cane-fields, five specimens were identified, which extend the range of this species considerably southward.

One adult male of the small series is from Ingham, 144 miles south of Cairns by rail and a few miles south from Hinchinbrook Island, where *insulæ* occurs. Three males and one female are from the Ayr district, 260 miles from Cairns, and 50 miles south of Townsville. These specimens not only add greatly to the known range, but also serve to confirm the distinctness of the hitherto little known species. The general appearance and dimensions conform well with the original measurements, though the body and tail dimensions of the type, taken from a skin, appear somewhat smaller, a variation which may be checked later by an examination of the crania.

Additional specimens from the Ingham district have recently been identified amongst a collection of rats submitted for examination by officials of the Colonial Sugar Refining Company in regard to the investigation of economic damage by rats in the cane-fields of northern Queensland. According to their field observations it appears that although this species, per individual, actually chews less fibre, its climbing abilities aided by the use of the semi-prehensile naked scaly tail result in deeper chewing of standing cane well above ground, causing the breaking down of a much larger proportion of stalks. It is of considerable interest to find that this species of *Melomys*, previously known on the cane-fields as the "Tree Rat," is regarded as actually causing greater economic damage individually than either the indigenous *Rattus culmorum*, known as the "Cane Rat," or the introduced long-tailed species, *Rattus rattus*.

[1] Lonnberg.—Kungl. Sv. Vet. Akad. Handl., lii, 2, 1916, p. 5.
[2] Troughton & Le Souef.—Australian Zoologist, vi, 1, 1929, p. 96.

A NEW GENUS AND SPECIES OF GIANT RAT FROM THE SOLOMONS.

By

ELLIS LE G. TROUGHTON,

Zoologist, Australian Museum.

(Plate xix.)

THE discovery of this remarkable animal, which makes such an interesting addition to the several genera of giant rats described from New Guinea, and represented so far in the Solomons by the genus *Cyromys* on Guadalcanar, has resulted from the very keen collecting activities of Rev. J. B. Poncelet, S.M., of the Catholic Mission at Buin, in the south of Bougainville Island. During a visit to the Museum early in 1934, Father Poncelet made enquiries regarding collecting possibilities on the island, with the result that his generous offer to make a representative collection for the institution was gladly accepted, and the necessary instructions and equipment supplied.

The energetic and thorough methods of the collector may be gathered from the fact that several carefully tabulated collections of insects, fishes, reptiles, and mammals have already been received, of such numbers and variety that considerable time must elapse before the material can be thoroughly worked out. Particular attention has been devoted by Father Poncelet to the mammals, included in which are several rats not hitherto recorded from Bougainville, and species of large and small bats, to be dealt with in a following paper.

In dealing with this outstanding novelty at the earliest opportunity, comparison with *Cyromys*, probably the nearest ally in form as well as habitat, has been prejudiced by the lack of illustration or adequate description of the dentition of both species of that genus. When one notes how simply and clearly the accompanying photos, by the Museum photographer, Mr. G. C. Clutton, illustrate diagnostic features such as the length and sparseness of the coat, tail and foot structure, and dentition, it is astonishing to realize that most of the Australasian mammals described abroad have been denied any form of illustration whatever. One can only hope that all future work upon the mammals, and fauna generally, may provide illustrations where necessary to amplify the usual brief descriptions.

Unicomys gen. nov.

Diagnosis. Size large. Hair long and sparse, without close underfur. Hind foot relatively large, the inner or thenar pad long, broad, and continuous with the 1st interdigital pad. Tail long, slightly exceeding the head and body in the holotype, about 76 mm. from the vent covered with hair up to 80 mm. in length; remainder almost naked, the mm. long hairs limited to one to a scale; the irregular rings average four to five to the cm., set with non-overlapping rudimentary scales with low crinkled surfaces. Palate ridges: Two raised and thickened pre-molar ridges, undivided but slightly indented in the middle line; six less inflated and rather irregular inter-molar ridges, the 2nd to 6th clearly divided. Mammae 2-2 = 4. Habitat: Bougainville Island, Solomons Group.

Skull.—Zygomatic arches powerful and widely expanded, the anterior plate very broad and straight-edged anteriorly. Interorbital region concave, the edges somewhat thickened but not beaded, the sinuous ridges developing post-orbitally and tending to form an angular process at the fronto-parietal suture; the subsidiary post-orbital process, below the ridge, not as prominent as in *Cyromys*. Palatal foramina short, ending about 5 mm. in front of m^1. Palatal space between first molars wider than the single molar. Bullæ small and little inflated.

Dentition.—Incisors normal, not unduly elongate or grooved anteriorly. Upper molar laminæ without the marked zig-zag pattern of *Mallomys*, the anterior laminæ of m^1 and m^2 much as in *Rattus*, but their hind margins infolded instead of broadly convex; anterior lamina of m^3 separate and transverse, with outer and inner cusps, and the hind lamina transversely elongate instead of oval as in *Rattus*. Lower molar series differing from the usual *Rattus* pattern attributed to *Cyromys* in the following details:—All laminæ except the first and last bent backward laterally, forming an angle in the middle line. Small but distinct antero-external subsidiary cusps are situated on the last lamina of m_1, and m_2, instead of on the anterior lamina of m_2 and m_3 as in *Rattus*.

Genotype.—*Unicomys ponceleti* sp. nov.

Remarks.—Apart from the hairy instead of woolly type of pelage, and relatively larger hind foot, distinguishing it from both *Cyromys* and *Mallomys*, the genus is further separated from *Cyromys*, which is of generally similar cranial dimensions, by the relatively longer and differently patterned molars, and differences in tail and sole-pad structure. Distinguished from *Mallomys* also in having palatal foramina barely half as long, the inter-molar space wider, instead of narrower, than the first molar, and by differences in the molar patterns. At once distinguished from the large coarse-haired Papuan genera *Hyomys* and *Anisomys* by the patterns and relative size of the molar rows.

The comparatively great size of the hind foot and skull is shown by the foot of a young adult female equalling, and the skull being actually longer than those of the Philippine *Phlœomys*, which is regarded as the largest member of the family *Muridæ*. The foot length is also greater than in an adult male of *Mallomys hercules* with head and body over 5 inches longer, while the skull length of an old male is only 7·8 mm. shorter than in the large *Mallomys*, described as having the largest skull of the sub-family *Murinæ*.

Diagnosis of the new genus involved a close survey not only of *Cyromys*, probably the nearest in structure as well as habitat, and *Mallomys* of Papua, but also of the Philippine *Lenomys* and *Crateromys* with whose dentition, in the absence of figures, that of *Mallomys* was compared. Lack of a detailed description or figures of *Cyromys* dentition is unfortunate, but a review of the characters confirms the generic distinction of the new form, which should prove of considerable interest in regard to the relationships and distribution of the fauna of the Austro-Pacific region.

Unicomys ponceleti sp. nov.

A uniformly blackish giant rat, readily distinguished from both species of *Cyromys*, which are probably the nearest allied in general form and dimensions, by the diagnostic features emphasized in the generic description. Habitat: Bougainville Island, Solomons Group.

External Characters.—Colour uniformly sombre brownish-black above and below. Hair remarkably long, fine, and sparse, without close or woolly underfur, so that the skin shows through on any part as the specimen is moved; the shorter, somewhat softer hair of the back averaging 30 mm. in length, the longer hairs ranging from 50 to 65 mm., and the longest attaining 80 mm. on the rump and tail base. Face very thinly haired on the cheeks and around the eyes, so that the gradually lengthening hairs above, from rhinarium to nape, give the head a strikingly crested appearance in profile. Ear comparatively short and broad, barely attaining half the distance between its anterior base and the posterior canthus of the eye when pressed forward. Manus almost naked above, the palmar surface lightly granulated and the pads inflated and faintly striated; the thenar pad remarkably large and flattened, its toughened surface covering the base of the short pollex and extending across to the middle line of the palm, its front edge tri-lobed or foliated, and its area about 10·5 x 10·5 mm. Pollex very short and stout, measuring only 5 mm. from base to tip of the broadly arched nail, which entirely covers it. Pes also thinly haired above, proportionately very large, and remarkably prehensile in appearance, with the 1st and 5th digits extendible almost at right angles, and the 2nd and 4th widely separable. Sole, pads, and digits very smooth in comparison to size, the pads large and inflated, their surfaces microscopically lined, rest of sole faintly rugose; main or hind part of thenar pad long and broad (15 x 6 mm.) and differing from that of *Cyromys* in being continuous with the 1st interdigital pad, the apparent division by a small intermediate pad being due to natural creasing, and the entire combined pad measuring about 26 mm. Tail of holotype slightly exceeding the head and body length, long-haired for about 3 inches (76 mm.) from the vent, the remainder almost naked, the hairs about 1 mm. long, limited to one between each scale, set in the grooves between rings; the scale-rings wide, averaging four to five to the cm., and the scales isolated, not overlapping each other or the grooves between, their crinkled surfaces giving the tail a peculiarly serrated appearance, except on the terminal fourth, where the irregular rings seem like large smooth scales. Mammæ 2–2 = 4.

Skull.—Broad and strongly built, with widely expanded powerful zygomatic arches, the anterior plate very broad and almost straight edged in front, its width in the middle line varying from 8 to 10 mm. in three skulls. Interorbital region concave, with the edges somewhat thickened but not beaded, the ridges developing post-orbitally and tending to form an angular process at the fronto-parietal suture, below which is a subsidiary post-orbital process, distinct from the crown-ridge but not as prominent as in *Cyromys*. Palatal foramina short, ending about 5 mm. from m^1. Palatal space between the first molars wider than the single molar. Hind margin of palate about in line with the middle of m^3. Bullæ small and little inflated.

Dentition.—Incisors normal, the lower ones not unduly tapered, or grooved anteriorly. Molar series relatively longer than in either species of *Cyromys* and, with the exception of the anterior laminæ of m^1 and m^2, differing in the following characters from the normal *Rattus* type indicated for the allied genus. Hind lamina of the two anterior molars folded backwards laterally, instead of outwards to form a cusp, so that except when very worn the hind margins are infolded, instead of being broadly convex; m^3 differs in having the anterior lamina separate and extended laterally to form outer and inner cusps, while the posterior lamina is transversely elongate, instead of oval as in *Rattus*. Lower molars differing in having the anterior lamina of m_1 narrower and without the antero-external notch seen in the unworn lamina of *Rattus*. All other lamina except the last differ in being bent backward

laterally, so that they are notched or angled in the middle line. The small but distinct external subsidiary cusps are situated between the second and third lamina of m_1, and the first and second lamina of m_2, instead of being on the first lamina of m_2 and m_3, as in *Rattus*.

Dimensions of Holotype, young Adult Female.—Complete in alcohol: head and body 330; tail 340; hind foot, length 71·5, breadth at base of first to fifth digits 23; ear 23 x 21 mm.

Skull: Holotype, and skull with worn molars in brackets; greatest length 62·8 (69·2); basal length 56·5 (62); zygomatic breadth 34·8 (38·3); breadth outside m^1 13 (13·4); breadth inside m^1 5 (5·5); interorbital width 10·1 (9·8); nasals 22·3 × 7·2 (25·7 × 8·7); palatilar length 30·2 (32·8); palatal foramina 7·6 x 3·4 (7·8 × 4); upper molar row 13·4 (13·8); width of m^1 4·1 (4).

Habitat.—Collected in densely wooded country, about 10 miles inland from Buin, south Bougainville Island, Solomons Group, where it is very rare, and is called "Nagara" by the natives, according to Father Poncelet.

Type Specimens.—Holotype, young adult female, No. M. 5756, and two paratype skulls, Nos. S. 1940–1, with more or less worn molars. In the Australian Museum; collected and donated by Father J. B. Poncelet, S.M.

Remarks.—The prehensile nature of the long and naked tail, and large well-padded feet with their extremely mobile and strongly clawed digits, suggest that this giant rat leads a mainly arboreal existence amongst the dense foliage of its habitat. There seems little doubt that the striking characteristics and dental features have evolved during prolonged isolation on Bougainville Island, similar to that of *Cyromys* on Guadalcanar, which Thomas regarded as accounting for the occurrence of both an arboreal and terrestrial species of that genus, actually as modified descendants of a single insular form.

It is with great pleasure that the name of the collector and donor is associated with this interesting species in appreciation of the important and careful field-work, which he voluntarily undertook and has carried out so enthusiastically under what at times must prove extremely trying conditions.

EXPLANATION OF PLATE XIX.

Unicomys ponceleti gen. et sp. nov. Holotype, young adult female.

Fig. 1.—Complete animal.
Fig. 2.—Palm, right manus.
Fig. 3.—Sole, right pes.
Fig. 4.—Tail, section slightly enlarged.
Fig. 5.—Skull, left side.
Fig. 6.—Skull, upper view.
Fig. 7.—Skull, lower view, showing dentition.
Fig. 8.—Lower molars.

STUDIES ON FRESH WATER SPONGES FROM AUSTRALIA. No. 2.

By

NATHANIEL GIST GEE,

(Vice-President of Yenching University, 150 Fifth Avenue, New York City).

THROUGH the courtesy of the Trustees of the Australian Museum, Sydney, Australia, I have been privileged again to examine four additional small specimens of fresh water sponges which have been added to their collections since the publication of "Studies" number 1[1].

A NEW RECORD OF OCCURRENCE FOR AUSTRALIA.

Ephydatia crateriformis (Potts).

Two of the four sponges studied have been identified as *Ephydatia crateriformis*, a species which previously has been reported from India, the Dutch East Indies, China, the Philippine Islands and the United States of America. The extension of its range to Australia is therefore not unexpected, and it gives us pleasure to record this discovery. The species is a very variable one and there are decided differences between the more primitive forms and the ones in which the rotules are more perfectly developed. These specimens represent the more primitive form and in many cases the rotules of the gemmule specules are not nearly so well perfected as they are in some of the other specimens from other parts of the world.

1. The first specimen consisted of very small bits of sponge forming thin layers over small plant growths or leaves. The Museum label records only the following facts: "Heathcote Creek at Lilyvale, New South Wales. Collected by M. E. Gray, May 16, 1932." (Gee's No. 55054.)

2. The second specimen consisted of short, less than 3 centimetres, cylindrical growths with rounded or very thin, pointed ends. There were also one or two small pads of sponge in the package. It came from "Waterfall Creek, at falls, near Sydney, N.S.W., June 12th, 1934. Australian Museum No. Z 2684." (Gee's No. 55055.)

Skeleton Spicules.—The skeleton spicules vary from around 255 to as much as 323 microns in length and from 7 to 16 microns in thickness. They are rather slender, usually curved, and terminate in sharp points at both ends. They are covered with minute spines which are scattered irregularly over the entire surface except at the extreme tips of the spicule.

Gemmules.—The gemmules were not abundant.

Gemmule Spicules.—These spicules average about 5 microns in thickness, the extremes ranging from 4 to 7 microns. In length they range from about 110 to 122 microns. They are straight or slightly curved. Many of them have quite irregularly formed rotules, though in the more typical ones the rotules are fairly well developed by the spines around the end of the spicule. The tips of the larger spines at the end of the spicules are slightly curved inward toward the centre of the shaft. Most of the spines are simple, sharp pointed and perpendicular to the shaft.

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[1] Records of the Australian Museum vol xviii, No. 9, 10 June, 1933.

As a rule the spines are larger and more numerous at and near the ends of the spicules, while the central portion of the shaft is free, or nearly so, from spicules and when present they are much smaller than those at the ends. The first (No. 55054) specimen is the more regular and typical one. The other one has larger spines and they are more irregularly distributed along the shaft.

ADDITIONAL LOCALITIES FOR A SPONGE ALREADY RECORDED.

Ephydatia multidentata (Weltner).

Two additional specimens came to me this fall and I have just had an opportunity to study them.

3. This specimen " from the pipes of the Molong water supply catchment, N.S.W., February 2nd, 1934," was presented to the Museum by the N.S.W. Public Works Department, and is numbered Z 2696. (Gee's No. 55100.) It is a small specimen, 3 by 5 centimetres, is white in colour, and the cottony mass is full of pores and was badly crushed. There were distinct linear fibres made up of several spicules in thickness and these were closely bound together by smaller transverse fibre bundles. The water in which this specimen was found must have been very free from sediment of any kind.

4. The other specimen consisted of small straw-coloured broken bits, a few of them as much as 15 mm. in thickness. The upper surface of the specimens was irregular and somewhat tufted. The vertical fibre rays were quite distinct. The specimen came " From a 36-inch watermain at Chichester Dam, N.S.W., September 23rd, 1933." Presented by Ivor Callen. Museum No. Z 2690. (Gee's No. 55101.)

Skeleton Spicules.—The spicules vary in length from around 238 up to as much as 366 microns and are from 10 to 23 microns in diameter. They are spindle shaped and vary from straight ones to those which are decidedly bowed. The spicules are often smooth but many of them bear very fine spines which are visible only under the higher powers of the microscope. The spines in the Chichester Dam specimen are larger and more numerous than in the sponge from Molong. The spicules of the Chichester Dam sponge are also a little thinner than those of the other one.

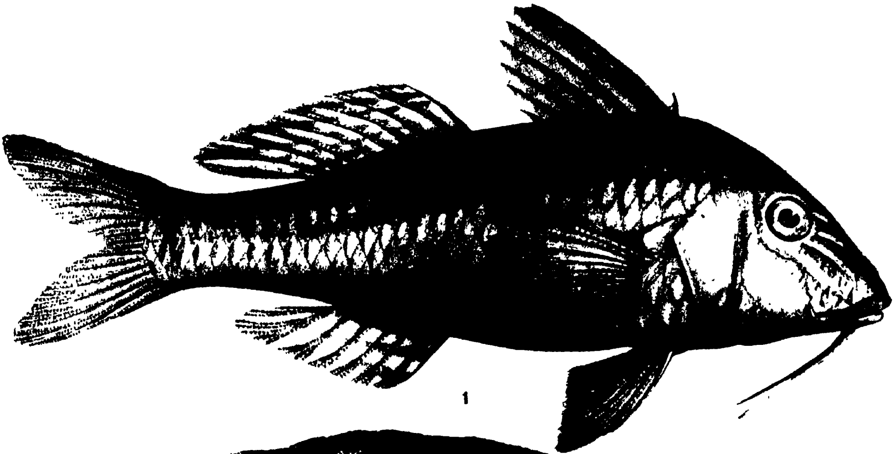
Gemmules.—In the Molong sponge, the gemmules were small, very abundant, white in colour and were crowded throughout the entire structure of the sponge; in the other sponge the gemmules were much fewer in number and those present were clustered in the basal area of the specimen.

Gemmule Spicules.—These spicules vary from 26 to 64 microns in length: their shafts are from 4 to 6 microns in diameter; and their rotules have a diameter varying from 15 to 27 microns. The size of the two rotules of the spicule in these sponges often differs, the smaller rotule being the outer one. This characteristic is a very common one of the Australian *Ephydatias* and they often differ from this genus in other parts of the world in this respect. The edges of the disks are incised and terminate in fine points. Both surfaces of the disks are covered with numerous fine spines. The shafts may be either straight or somewhat curved, they are slender and usually uniform in diameter except right at disks where they are enlarged as they join them. They are entirely and abundantly covered with small spines. Now and again one or more long spines are found in the center of the spicules of the sponge from the Chichester Dam; these are not often present in the other sponge.

NEW COLLECTIONS.

Doubtless a number of additional sponges will be located in the fresh waters of Australia and its contiguous areas. It is hoped that all collectors of fresh water forms of any kind will keep sponges in mind and maintain a lookout for all forms, not only the most conspicuous ones, but also those which are very minute and which grow on the under surfaces of stones or floating objects in bodies of water. In making collections a good supply of the material should be taken so that one can get some idea of the method of growth of the animal. Also care should always be taken to secure gemmules which frequently are stored away in the basal portion of the specimen. Gemmules are necessary for a satisfactory determination of the species. The Australian Museum will gladly co-operate with collectors of fresh water sponges.

Sydney: Alfred James Kent, I.S.O., Government Printer—1935.



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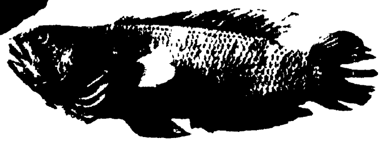

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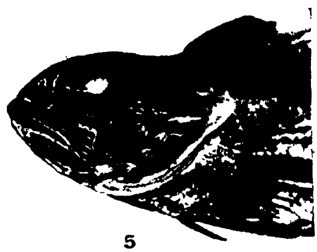

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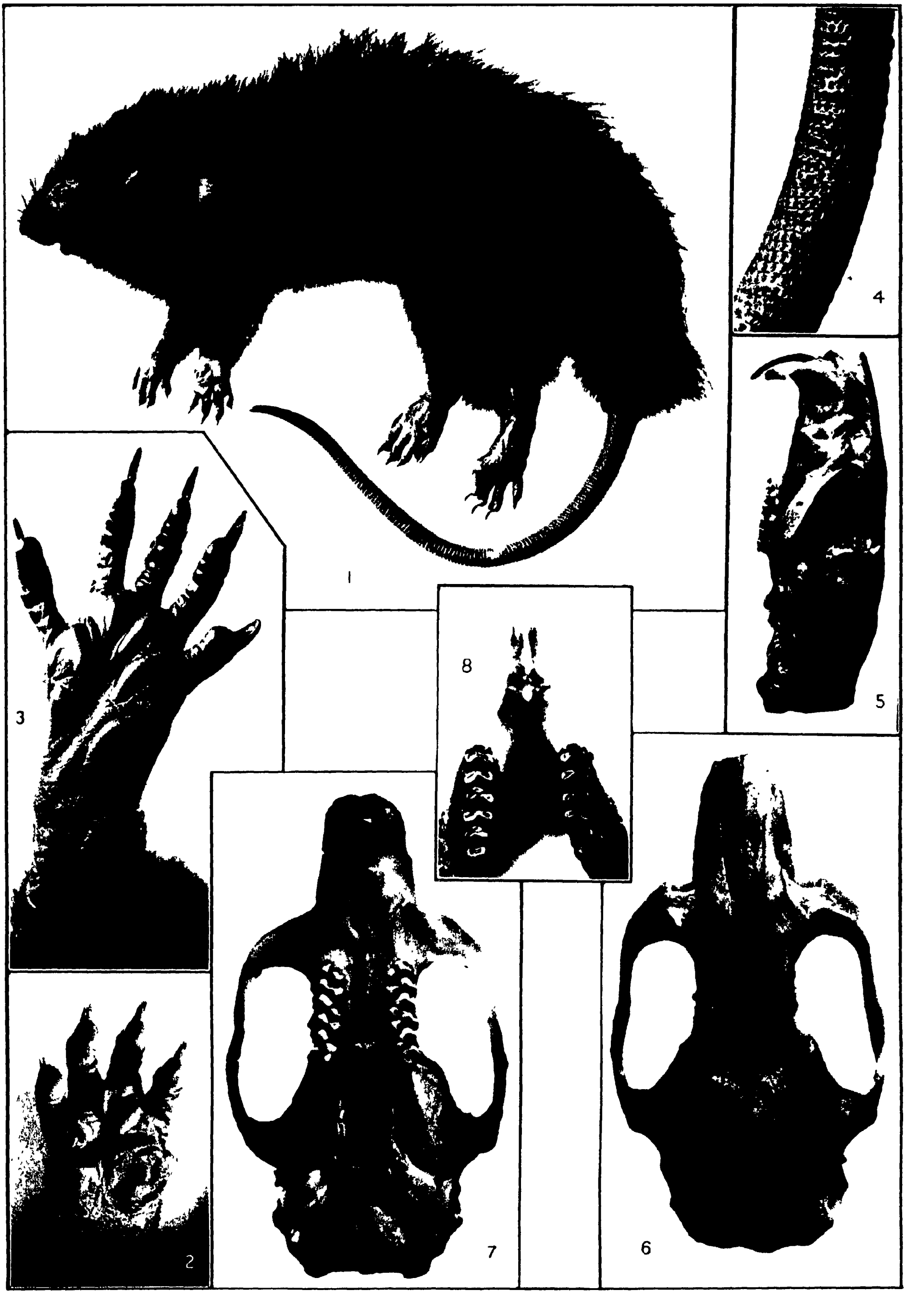
D. B. FRY (1), *del.*
G. C. CLUTTON (2–6), photo.



G. C. CLUTTON, photos.

AUSTRALIAN MOLLUSCAN NOTES.
No. 2.

By TOM IREDALE.
Conchologist, The Australian Museum.

(Plates xx—xxiv.)

MANY of the shells described in "Australian Molluscan Notes, No. 1*" were derived from dredgings dumped at Dundas, on the Parramatta River. Owing to the depression, the operations of the dredge "Triton" have been suspended for the past three years, and, for the same reason, the trawling fleet, another prolific source of interesting material, has not been working continuously. Nevertheless, consideration of the forms obtained from the Dundas dump, and the results of a few successful finds, necessitate a number of notes, and a large number of records has accrued.

I again have to thank Miss J. Allan and Mr. G. C. Clutton, whose drawings and photographs make the species very easy to distinguish when specimens are compared.

Cucullaea vaga Iredale.

(Plate xx, fig. 1.)

Mr. W. L. Dingeldei has been collecting specimens obtained from Captain K. Moller, and anything strange he has brought in to the Museum. Through his efforts most of the trawled novelties have been secured. A nice valve of *C. vaga* is here figured, procured off Shoalhaven Bight in about forty-five fathoms, a southernmost record, the species having been described from off Norah Head, north of Sydney. This specimen shows the deeper shell and the coarser sculpture well, the latter even showing obsolescence. Mr. Bernhard, of Rockhampton, has sent specimens from Keppel Bay, indicating that the northern and southern species overlap about that locality. One shell agrees with the figure here given, but the other is larger, more elongate, the ventral margin swollen medially, and the sculpture consists of many fine radials closely packed and almost beaded laterally through the numerous concentric lines that usually only slightly cut the radials.

Family **ARCIDAE.**

I have reviewed the Queensland members of this family in a report on the Mollusca of Low Isles, to be published later, but will here comment on the New South Wales species, which had to be studied simultaneously. A well-known northern species straggles as far south as New South Wales, but is not included in Hedley's local catalogue. It was listed in the Queensland fauna as *Arca foliata* Forskal, and G. P. Whitley and I made a good collection of valves from the beach at Caloundra in order to study the variation. I found that two species had been confused. One was pure white with coarse sculpture on the posterior angulate portion, and the other had that area finely sculptured and coloured red-brown, the former being the *foliata* and the latter the *fasciata* of Hedley's list. Later it was found that the white shell of the coral reefs, also called *foliata*, was different from both, and the problems involved have been worked out in the paper above cited.

A few complete specimens of *Arca metella* Hedley have been secured on the Continental Shelf, and these prove to belong to no known group. They show the right valve to be the smaller and clasped by the left, and a well-marked median

* For No. 1, see Records of the Australian Museum, Vol. xviii, No. 4, 1931, p. 201.

depression appears on both valves, less noticeable on the right. The ligamental area is long and broad, and naked, save behind the umbones, where a narrow triangular line runs backwards. This being apparently a deepwater relation of the series known as *Acar*, the differences need recognition, and the new generic name *Destacar* is assigned to it. The species, *A. strabo* Hedley, which also occurs on the Continental Shelf, is very different, having sculpture and form allying it to the fossil *cainozoica* and somewhat similar hinge teeth. These are long and slanting, and recall those of *Cucullaea*, but the shell differs entirely from that genus, as shown by Hedley's excellent figures. It is here made the type of the new genus *Samacar*, the deep concentric grooving forming a distinctive feature. The ligamental area is very narrow, and seems to be almost completely naked in the one living specimen available, agreeing in that with the many single valves examined.

Family **PINNIDAE.**

Hedley[1] revised this family, and from this account the local species would read *Pinna isosceles* Hedley, *Pinna menkei* Reeve with var. *caviterga* Hedley, *Atrina strangei* Reeve and *A. tasmanica* Tenison-Woods. Winckworth[2] has reviewed Indian species, and, through an unaccountable lapse, has overlooked Hedley's paper, and has amassed for some species a long synonymy which is not upheld by a study of Australian series. The Queensland and Western Australian forms will be dealt with elsewhere. Winckworth suggests *menkei* as a synonym of *atropurpurea* Sowerby, a species shortly described from unknown locality and not figured. The whereabouts of the type (sold by auction) are unknown to me, but if Hanley[3] figured it, then the Australian so-called *atropurpurea* of Hedley is different, as is the local *menkei*. Winckworth suggested as doubtfully synonymous, *madida* Reeve, but that Australian species is quite distinct. A good photograph of the local *menkei* has just been published in the "Australian Museum Magazine,"[4] and there is little variation seen in this species. Hedley[5] introduced as a new species, *Pinna isosceles*, intending the name to take the place of *muricata* as locally used, but unfortunately for his type he selected a small specimen which proves to be only a stunted abnormality of *P. menkei* Reeve. Thus his name falls as a synonym, and there is no record of the "*muricata*" style of shell from New South Wales, and it is very unlikely that there will be, if the conclusion that it is purely a coral-living species be correct.

On the other hand, the specimen which Hedley referred to as *strangei* approaching *hystrix* from Ballina, is apparently a juvenile of the *vexillum* series, and this addition may take the place of "*isosceles*." Dingeldei picked out of the harbour dredgings a very small *Pinna*, which appears to be the young of one of the *assimilis* series, and there is an old specimen of that group in the Museum, but the only locality given is "New South Wales."

Family **OSTREIDAE.**

Since writing[6] about the members of this family a complete revision of eastern Australian forms has been made, but as publication is deferred, the New South Wales forms may be here mentioned.

[1] Hedley.—Rec. Austr. Mus., xiv, 1924, pp. 141–153.
[2] Winckworth.—Proc. Mal. Soc. (Lond.), xviii, 1929, pp. 276–297.
[3] Hanley.—Recent Bivalve Shells, 1856, p. 255, Suppl., pl. 24, fig. 36.
[4] Allan.—Austr. Mus. Mag., v, 1934, fig. on p. 222.
[5] Hedley.—Rec. Austr. Mus., xiv, 1924, p. 145, pl. xix, fig. 1.
[6] Iredale.—Proc. Linn. Soc. N.S.W., xlix, 24 Oct., 1924, pp. 191–2.

O. virescens, which was left in doubt, is a very distinct little species quite common and characteristic. The Sydney name, *O. angasii*, may be resumed for the local (apparently extinct) shell.

Another apparently extinct species is *Lopha hyotis* Linné, of which huge tropical species Captain Comtesse picked out from the " Triton " dredgings a very old but characteristic upper valve. This is much smaller than the existing shells collected in Queensland, and may represent a sub-species, *L.h. notina* nov. (Plate xx, fig. 2).

The Rock Oysters are very distinct in every essential feature so that *Saxostrea* is proposed for *Ostrea commercialis* Iredale and Roughley.[7] This genus may be diagnosed as follows: Small to medium-sized oysters, the lower valve deep and sometimes cup-shaped, the upper valve flattened; adherent to rocks by the greater part of the lower valve; generally deeply colored, bluish to black; the hinge line short, the hinge plate medium, the internal edges of valves more or less crenulated. The juvenile is rounded and flattened, sometimes spinose, but the spines disappear with age, and commonly a radially crumpled sculpture is seen in the adult. As regards its life history, full details of which are given in the article by Roughley cited, the animal is dioecious, the egg small, the adult non-larviparous.

Decatopecten strangei Reeve.

(Plate xx, fig. 3.)

Among Queensland and Western Australian Scallops many groups were observed which differ greatly from the southern series distinguished recently.[8] These will be fully treated in another place, but Mr. H. S. Mort brought in a valve from the Dundas dump similar to one he had found at Low Isles. The valve appears to be referable to *Pecten strangei* Reeve,[9] and is here figured.

The generic name *Decatopecten* was introduced by Sowerby,[10] ex Rüppell, and later by Swainson[11] as *Decadopecten*, also referred to Rüppell, but so far no publication of the name by Rüppell has been found. In each case the type was *Ostrea plica* Linné. It may be noted that Gray[12] in 1847 quoted the generic name as " *Dentipecten* Rüppell 183–?."

Dimyarina gen. nov.

Type.—*Dimya corrugata* Hedley.

When Hedley[13] introduced this shell as a species of the fossil genus *Dimya* he was dependent on odd dead valves. It has since been found frequently on the Contintental Shelf in the living state, and the shell is often found practically free. It is a shining white with a silvery sheen, and differs decidedly from the fossil type, the hinge and general appearance suggesting a close relationship with *Plicatula*. Hedley's description is good and sufficient.

Monia deliciosa, sp. nov.

(Plate xx, figs. 7, 7a.)

Not uncommon in deep water, this species may be shortly described, as there is not much that cannot be seen in the figure.

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[7] Iredale and Roughley.—Proc. Linn. Soc. N.S.W., lviii, 15 Sept., 1933, p. 278; Roughley, tom. cit., p. 279.
[8] Iredale.—Rec. Austr. Mus., xvii, 1929, p. 162.
[9] Reeve.—Conch. Icon., viii, pl. iv, sp. and f. 22, 1852: Moreton Bay.
[10] Sowerby.—Conch. Man., 1st ed., 1839, p. 37.
[11] Swainson.—Treat. Malac., 1840, p. 388.
[12] Gray.—Proc. Zool. Soc. (Lond.). 1847, p. 200.
[13] Hedley.—Austr. Mem., iv, p. 309, 29 July, 1902, fig. 52 in text.

Shell subcircular, thin, depressed, white, showing fine concentric growth lines only. Interior white, muscle scar slightly greenish.

Dimensions of type: Height, 30 mm.; breadth, 29 mm.; depth of conjoined valves, 5 mm. Along the Continental Shelf of New South Wales. Type from about 75 fathoms off Cape Everard, Bass Strait.

The shore forms in this group are difficult to determine by means of shell characters and muscle scars, though Winckworth has shown that the British species can be separated by means of the gill formation.

The common species of "*Anomia*" is listed as *walteri* Hector, a name given to a New Zealand shell to which the local shell bears a strong resemblance. In the juvenile, and typically, the muscle scars are three, one semicircular, the diameter away from the hinge, and, below, two similarly shaped ones separated by a narrow line. As the shell develops the lower pair appear to grow more apart obliquely until they recall the muscle scars of *Patro*, that is there are three separate muscle scars, the uppermost semicircular, the other two circular, the lowest the largest. In coloration the shades vary from pale greenish white, through yellow and orange, to a deep bronze red. The sculpture is normally low wavy ridges, and the shape subcircular, the breadth more than the length. Conditions of living alter the proportions and sculpture greatly, the latter commonly showing nodulation. In all the Neozelanic specimens available the two lower muscle scars are attingent, a state never seen in the common Sydney shell, so that by this criterion the Sydney shell is a different species and is named *Anomia descripta* sp. nov. (Plate xx, fig. 6.) The lower valve is usually greenish, whatever the colour of the upper valve may be, always becoming darker as the upper valve becomes brighter, so that a bronze-red upper valve may reveal a dark-green to blue lower valve.

Monia can always be recognized by its muscle scars, only two in number, the upper one showing a striated appearance. The shell is always greenish, and has a surface sculpture of ridges, with fine prickles when in good condition.

Genus **Musculus.**

Some years ago I[14] determined *Musculus* Bolten as the generic name for the group commonly known as *Modiolaria*. This was challenged by Dall, who contended that Bolten's name was preoccupied by "*Musc.*" of Martyn, a somewhat curious argument. Unfortunately this view has been accepted by Grant and Gale[15], so that it is fortunate that the rejection of Martyn's names obviates further argument. The three species on the New South Wales list resembling the Neozelanic type, *impacta* Herrmann, bear the names *cumingianus* Reeve, *cuneatus* Gould, and *varicosus* Gould. While the type locality of the first named is Moreton Bay, and of the last named Sydney, the type locality of *cuneatus* Gould is False Bay, Cape of Good Hope. The description of the African shell does not apply to the local shell, as it reads "sulcis quadratis punctatis, anticis 16, posticis 30." Bartsch gives 16 and 17, while our shell counts about 15, 20. As our species has been confounded with *cumingianus* the two are figured for comparison.

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[14] Iredale.—Journ. Conch., xiv, 1915, p. 342.
[15] Grant and Gale.—Mem. San Diego Soc. Nat. Hist., i, Nov., 1931, p. 253.

Musculus ulmus, sp. nov.

(Plate xxi, fig. 10.)

Shell small, transversely oval, equivalve, very inequilateral, umbones anterior, dorsal and ventral margins subparallel, the latter very little rounded. The umbones are incurved, placed very anteriorly, the anterior side being almost perpendicular, the posterior side horizontal and then depressed in a curve to meet the ventral margin. An elevated rounded rib runs from the umbo to this posterior curve. The sculpture on the anterior area is rather coarse, fifteen flattened ribs with narrow interstices, and a smooth wide area separates this sculptured area from the similarly, but more finely, ribbed posterior area, about twenty ribs being counted.

Length, 9 mm.; height, 6 mm. Type from Sydney Harbour. Habitat—New South Wales.

Genus **Quendreda** nov.

Type—*Dacrydium fabale* Hedley.

The species Hedley[16] ascribed to *Dacrydium* differs in shape, form, and sculpture from the Spitzbergen shell, the type of Torell's genus.

Genus **Eucrassatella.**

Accession of material enables adjustment in the genus *Eucrassatella* with recognition of more species than were recorded in a previous paper[17].

While, in consideration of previous workers, the forms around the Australian coast were regarded as geographical representatives it is now found that two distinct groups occur together in Western Australia, the smooth and the sulcate, and that Lamarck's *donacina*, described as from Shark's Bay probably did come from that locality. At any rate a smooth shell comes from Dongera, close to Shark's Bay, which agrees fairly with Lamy's figure of the type, and differs decidedly from *sulcata* Lamarck=*pulchra* Reeve, also from that locality, in shape and hinge as well as sculpture.

Many valves collected at Friday Island, Torres Strait, by Mr. Melbourne Ward are all smaller, and have shorter beaks than the Moreton Bay *cumingii*, and are therefore called *E. cumingii wardiana* subsp. nov. The most interesting discovery, however, is a broken half of a valve collected by Captain Comtesse from the "Triton" dredgings. It represents indubitably a new species, being sulcate throughout, the sulci distant, very unlike those of *cumingii*, and more like the typical *pulchra* from West Australia. It is altogether unlike *kingicola*, which is found in southern New South Wales, and on account of its importance is here named *Eucrassatella genuina* sp. nov. Height, 60 mm.; breadth, 45 mm.; probable entire breadth, 80 mm. (Plate xx, fig. 4.)

The South Australian form of *kingicola* is undoubtedly more elongate than the typical one, with the umbones less plicate and may even be specifically separable. For the present it may be called *E. kingicola verconis* subsp. nov., the type from St. Vincent Gulf, South Australia, being 89 mm. long, 69 mm. high, and the conjoined valves 38 mm.

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16 Hedley.—Proc. Linn. Soc. N.S.W., xxix, 1904, p. 199, pl. 10, fig. 39.
17 Iredale.—Proc. Linn. Soc. N.S.W., xlix, 24 Oct., 1924, p. 202.

At Lord Howe Island there also lives a form very like the Moreton Bay *cumingii*, but the beak is more attenuated, somewhat sinuate on the ventral margin towards the posterior end; the sculpture also is finer, the sulcations are closer together and vanish ventrally. This may be called *E. cumingii baxteri* subsp. nov., the type measuring 64 mm. in length, 52 mm. in height, and the conjoined valves 30 mm.

Genera **Cuna** and **Condylocardia**.

The small bivalves classed under *Cuna* and *Condylocardia* are very confusing, and the so called genera present a heterogeneous aspect. The type of *Cuna* was *concentrica*. a small species with concentric sculpture, and closely allied forms do not occur in New South Wales. The nearest form is *Carditella delta* Tate and May, which has a similar form, but has radial sculpture, and the hinge teeth differ in detail. It is here named *Volupicuna*, and may be treated as a subgenus. Hedley's *C. particula* is very different, being oblique in shape, and with a different hinge, as pointed out by Hedley when he described it; the new genus *Saltocuna* is introduced for it. The species *Kellia atkinsoni* Tenison-Woods may be located here as it agrees fairly well. Hedley's *C. pisum* is so different that it was not recognised as a *Cuna* when first noted, being a much larger crass shell with a hinge of a different nature. It is here called *Cunanax*, gen. nov. Hedley has given excellent figures and descriptions of all these species.

The type of *Condylocardia* is *sanctipauli*, a species with radial sculpture, and *ovata* is quite dissimilar, having concentric sculpture and a different hinge formation. Similar to *ovata* are *trifoliata* and *projecta*, and these can be associated in the new genus *Condylocuna*, the species *projecta* being named as type. While *trifoliata* was described from Mast Head Reef, Capricorn Group, Hedley admitted it to the New South Wales list, and Verco included it in the South Australian fauna. Cotton has renamed Verco's *trifoliata*, *isosceles*, and Hedley's New South Wales shells must also be differentiated as *Condylocuna cambrica* nov. being broader, less strongly sculptured, with a protoconch proportionately larger and less notably trifoliate, the type locality being Chinaman's Beach, Balmoral, Port Jackson. Hedley and May recorded *Condylocardia porrecta* Hedley, from 100 fathoms off Cape Pillar, South Tasmania, giving beautiful figures, and this is here renamed *Radiocondyla arizela* gen. et sp. nov., the typical *porrecta* from Mast Head Reef being larger, more convex, the ribs more triangular and separated, and the hinge more compact. The species *Carditella pectinata* Tate and May may also be placed under *Radiocondyla*, but it may later be separated.

Genus **Carditella**.

This genus was introduced by Smith for a small South American mollusc, and later, when he was working out the " Challenger " shells, he added to his genus some Australian shells, but pointed out that they differed essentially in hinge-features. Nevertheless the association has been continued by Australian workers without re-consideration. I now separate Smith's *Carditella angasi* under the new generic name *Carditellona*. Tate and May described a Tasmanian shell as *Carditella elegantula*, and it is included in the New South Wales list under the same name. It is certainly not even congeneric with *C. angasi*, and is therefore differentiated as a new genus, *Carditellopsis*. Smith observed that no portion of the ligament was internal in *C. angasi*, though this was one of the main supports of his genus *Carditella*. In *C. elegantula* the ligament is also external, and the surface sculpture

is not that of the *Carditella* series but somewhat recalls the group *Cunanax*, with which the local specimens have sometimes been confused; the lack of an external ligament in *Cunanax* makes them easily separable. The local *Carditellopsis* is apparently narrower than the typical form, but long series are not available.

Epicodakia kennethi, sp. nov.

(Plate xx, fig. 10.)

Master Kenneth Blacket found on the Narrabeen beach two valves of a rather smooth oblique *Epicodakia*, very unlike any of the described forms. Shell small, convex, oblique, inequilateral, white. The sculpture consists of concentric fine ridges closely packed together, over-ridden at the sides only with a fine radial striation. The form can be seen from the figure, the apex being at about the anterior two-thirds, the teeth being small, the laterals set rather widely apart, and the muscle-scars Lucinid. The hinge is delicate, the impressed lunule of *Epicodakia* practically obsolete, the ligament groove being shallower and probably showing the ligament externally, so that a new subgenus *Talocodakia* is introduced.

Height, 20 mm.; breadth, 25 mm.; depth of single valve, 7 mm. Habitat—Narrabeen, north of Manly, New South Wales. The delicate sculpture, shape and teeth effectually distinguish this species from any other.

Divalucina, gen. nov.

Type—*Lucina cumingii* A. Adams and Angas.

This attractive shell has been placed in *Divaricella*, proposed for a Mauritius species. A shell similar to the Mauritius one occurs in North Australia, but the southern shell, in addition to being larger, with much finer sculpture, has notable lateral teeth, of which there is no sign in the northern species. Moreover, the cardinals in the present species are two in number, one being large and bifid, while in the northern form there are only two small scarcely projecting teeth, a large semi-internal ligament doing most of the hinge work. Further, in the southern genus there is no deep pseudolunule as in the typical *Divaricella*.

Grant and Gale[18] have placed *Divaricella* in the family Ungulinidae on account of its missing laterals, but suggest that the family might be included in the Codakiidae. Mr. B. E. Bardwell has sent a specimen of *Divalucina* from Roebuck Bay, North-West Australia, which agrees quite well in every feature save that the sculpture is finer, sixty waves being counted as against forty in a typical shell of the same size. This apparently represents a distinct subspecies, which may be called *D. cumingii bardwelli* nov.

Toralimysia, gen. nov.

Type—*T. excentrica* sp. nov.

Hedley[19] figured a Sydney shell under the name *Joannisiella sphaericula* Deshayes, but did not compare it with authentic specimens, and no shell was found under the name in the British Museum. The above name is therefore given to the shell Hedley figured, the new generic name being necessary as the type of *Joannisiella* proves, upon autoptic examination, to be different. The Queensland shell named by

[18] Grant and Gale.—Mem. San Diego Soc. Nat. Hist., i, Nov., 1931, p. 295.
[19] Hedley.—Proc. Linn. Soc. N.S.W., xxx, 1906, p. 544, pl. xxxii, figs. 18–21.

Melvill and Standen[20] *Diplodonta ethima* appears to be the true *sphaericula* or a very slight variant. Hedley's figures above cited are excellent, and the local shell differs from the type of *Joannisiella* in form and appearance, and especially in lacking the excavate pseudo-escutcheon in which the external ligament is buried. Our shell clearly shows the ligament outside, and has the cardinal teeth more spaced and the lateral grooving obsolete.

Borniola filosa Hedley.

(Plate xxi, fig. 2.)

Three species of *Borniola* occur in New South Wales, *filosa* Hedley from Middle Harbour, *lepida* Hedley from Manly beach, etc., and *radiata* Hedley from deep water, 111 fathoms off Cape Byron, New South Wales.

I introduced the generic name *Borniola*, naming *B. lepida* as type. The species described by Hedley as *Bornia filosa* occurred among the "Triton" dredgings as a very rare shell, and as it is pinched medially on the ventral surface commensalism with a crustacean by means of the byssus is suggested, it may be called *Byssobornia*. Hedley's description[21] is good, but unfortunately the figures of some other shell have been substituted for the correct ones, and so another figure is here given of a shell compared accurately with the previously unique type.

Genera **Kellia** and **Lasaea.**

For the past forty years these two generic names have been in use for small bivalves, but now Grant and Gale[22] point out that the type of *Kellia* is the same as that of *Lasaea*, and thus *Kellia* will take the place of *Lasaea*. Two species of the latter have been sometimes recognised, as there generally appears to be two different shells around here, but it is not clear what names should be used. Tentatively, until a complete revision can be undertaken, we may admit *Kellia australis* Lamarck[23] and *Kellia scalaris* Philippi[24] without prejudice as to the value of the observed differences.

Four species were ascribed to *Kellya* by Hedley, *adamsi* Angas, *jacksoniana* Smith, *solida* Angas, and *suborbicularis* Montagu, the last named being given a universal distribution, which is scarcely justified under present-day views.

Grant and Gale used *Chironia* Deshayes[25] for the *suborbicularis* series, but there is a prior *Chironius*,[26] as well as a *Chirona*.[27]

As *solida* Angas is very doubtfully congeneric even with *adamsi* Angas, a new generic name *Marikellia* is here proposed, with *solida* as type, and *adamsi* and *jacksoniana* can be placed under it, while *suborbicularis* may be left under *Chironia* until re-investigation settles the various matters as to specific and generic identity.

The New South Wales shell determined as *suborbicularis* differs in detail, and has been recognised by E. A. Smith[28] as *Erycina rotunda* Deshayes,[29] and this specific name may be used in connection with *Marikellia* until these small bivalves are critically examined as to animal characters.

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[20] Melvill and Standen.—Journ. Linn. Soc. (Lond.), Zool., xxvii, 1899, p. 197, pl. ii, figs. 17–17a.
[21] Hedley.—Proc. Linn. Soc. N.S.W., 1902, p. 7 (*not* figures pl. ii, figs. 15–17).
[22] Grant and Gale.—Mem. San Diego Soc. Nat. Hist., i, 3 Nov., 1931, p. 301.
[23] Lamarck.—Hist. Antm. s. Vert., v, 1818, p. 560.
[24] Philippi.—Zeitschr. für Malak. (Menke), 1847, p. 72.
[25] Deshayes.—Rev. Zool. (Cuv.), ii, 1839, p. 357.
[26] Fitzinger.—Neue Classif. Rept., 1829, pp. 29, 60.
[27] Lyell.—Phil. Trans, cxxv, 1835, p. 87.
[28] Smith.—Proc. Mal. Soc. (Lond.), v, 1902, p. 163.
[29] Deshayes.—Proc. Zool. Soc. (Lond.), 1855, p. 181, 5 Jan., 1856 : Moreton Bay.

Ambuscintilla, gen. nov.

(Plate xxi, fig. 4.)

Type.—*A. praemium* sp. nov.

When Whitley and I were searching the Bottle and Glass Rocks, Watson's Bay, recently, a bivalve was found hiding in the burrows made by the prawn, *Crangon*. It was superficially a Scintillid, and upon putting it into water the animal walked with its shell half open, and a long siphon outstretched in front, and one behind with smaller tentacles, quite unlike the animal of *Solecardia cryptozoica* Hedley,[30] though the shell was somewhat similar.

Shell very thin, delicate, translucent, broadly ovate, subequilateral. The muscle scars are connected, but a shallow pallial sinus is developed, and also a smaller muscle scar situated above the anterior adductor scar. The hinge shows a muscular ligament between the umbones and a small cardinal in each valve.

Breadth of largest valve, 9 mm.; height, 6·5 mm.

A similar animal was found in connection with a Scintillid shell at Low Isles, where three different animals were noted, the shells of which were the simple glassy forms associated together under the name *Scintilla*, and which gave little clue to their animal forms.

Regozara, gen. nov.

Type.—*R. olivifer* sp. nov.

A genus of the Cardiidæ, large, elongate oval, convex, sculptured with strong radial ribs, valves tightly closed, no lunule or escutcheon; teeth strong.

This group of Cardiums is very characteristic, and has been called *Trachycardium*, but that name belongs to a superficially similar American group.

Regozara olivifer, sp. nov.

(Plate xx, fig. 8.)

Shell large, thick, elongate oval, very convex. Coloration pale cream to white, mottled and marked with red-brown, the blotches becoming confluent with age.

The sculpture consists of elevated conical ridges, twenty-eight in number, the median ones tall, erect, angulate, and crossed by nodules which tend to coalesce towards the ventral margin. At the sides the nodulation develops into spinose beading, the very narrow interstices showing only growth lines, which appear to link up with the sculpture of the ribs as the shell grows larger.

Internal coloration white, margins strongly angulately toothed. Hinge teeth thick, laterals rather distant, cardinals somewhat separated.

Length of type, 66 mm.; breadth, 56 mm.; depth, 46 mm.; much larger ones occur.

Habitat.—Northern New South Wales; type from Sydney Harbour.

This fine species is included in Hedley's list as *Cardium flavum* Linné, but Hanley concluded that Linné's species was indeterminable, and proposed the acceptance of Schröter's identification, a method not now adopted. In any case a local New South Wales shell would be quite unknown to Linné. Then the Lamarckian name *rugosum* has been employed, but he cited Schröter for a shell from the Indian Ocean described as "*immaculata albida.*"

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[30] Hedley.—Proc. Linn. Soc. N.S.W., xli, 1916 (1917), p. 684, pl. xlvi, fig. 1, pl. li, fig. 40.

The Queensland shells referred to *flavum*, *rugosum*, etc., are under review in another place, and nothing exactly like the present species has been found in North Queensland, though three or four similar species have been determined.

On the other hand the species recorded by Hedley as *Cardium cygnorum* Deshayes and *Cardium oxygonum* Sowerby are not referable to those species, the former West Australian shell not reaching New South Wales, while specimens of the true *oxygonum* from the Philippine Islands, though superficially resembling the local shell, have been found to differ appreciably in detail, and will be described later.

Genus **Gafrarium.**

Hedley[31] used *Gafrarium quoyi* Hanley for a common Sydney shell, rejecting *scripta* Linné, and giving reasons for acceptance of Hanley's name. Tomlin [32], examining specimens in the British Museum, recorded synonyms of *scripta*, and cited *quoyi* as a synonym of *rivularis* Born, a different species.

Examination of Western Australian and Queensland shells referable to these series, which is here classed under *Circe*, indicated many local species, and furthermore caused the recognition of *sugillata* Reeve[33] as undoubtedly the well known local shell.

The Queensland shells and the Western Australian ones will be described later, while the very distinct South Australian shell has been described by Cotton.

Redicirce, gen. nov.

Type.—*R. mistura* nov.

A comparatively smooth species of the small *Circe*-like series was picked out of the Sydney Harbour dredgings, and upon comparison was found to be quite distinct from any of the recorded species.

Shell small, almost equilateral, rather trigonal in shape, a little convex, sculpture of fine concentric ridges and faint radials at sides. Hinge teeth much weaker than those of *Circe*, the hinge plate quite different and not very much like that of *Crista*, wherein Jukes-Browne has placed somewhat similar shells.

Redicirce mistura, sp. nov.

(Plate xxi fig. 3.)

Shell small, not very convex, somewhat triangular in shape, umbo almost median. Coloration whitish rayed with orange streaks, an underlying painting of angulate yellow lines being present. The rather shining, almost smooth surface shows a weak concentric ridging, with the distinctive curved radial ribbing almost suppressed and showing only at the edges of the shell towards the umbo. The small hinge plate differs entirely from that of a specimen of *Circe* of the same size and cannot be compared with that of *Crista*, from which genus the whole facies separates it, especially the small area enclosed by the pallial line, which is like that of *Circe*. Breadth, 20 mm.: height, 18 mm.: depth of single valve, 5 mm. Type from Sydney Harbour, New South Wales. Series from North-West Island, Capricorn group, Queensland.

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[31] Hedley.—Proc. Linn. Soc. N.S.W., xli, 1916 (1917), p. 688.
[32] Tomlin.—Proc. Mal. Soc. (Lond.), xv, 1923, p. 311.
[33] Reeve.—Conch. Icon., xiv, Oct., 1863, pl. iii, fig. 14.

Redicirce consola, sp. nov.

(Plate xxi fig. 5.)

A small valve picked out of shells trawled in 45–55 fathoms off Newcastle, New South Wales, is here named as it apparently represents another tropical series.

Shell very small, stout, a little convex, less triangular than preceding and differing in its corrugated surface, the radial side lines more developed. Coloration white, a couple of fawn blotches near the ventral margin. Internally the space inside the pallial line is pink, the rest white. Interior of margins smooth. Teeth rather like that of preceding, but hinge line comparatively stouter, as if the little shell were mature.

Breadth, 8 mm.: height, 7 mm.: depth of single valve 2 mm. Type locality as given above.

Nothing comparable has yet been seen from Queensland, although the shell has a vague resemblance to some shells of the *sulcata* group.

Pitarina osmunda, sp. nov.

(Plate xx, figs. 9, 9a.)

A note after the genus *Pitaria* in the New South Wales check-list reads: "*Pitaria citrina* was by Deshayes (Cat. Conchif. Brit. Mus. 1853, p. 72) erroneously cited from Sydney."

A small valve recalling shells collected in Queensland suggested that, even it Deshayes had erred, a species resembling *citrina* had lived here. Two larger valves, curiously enough a right and a left valve, were found at different times by Mr. W. L. Dingeldei, and comparison showed very little distinction from the tropical shells, but Lamarck's *citrina* has been determined by Hedley and recorded by Tomlin[34] as being equal to *Dione ustulata* Reeve[35] from the Swan River, and New Caledonia. The former locality would agree with Shark's Bay, whence Lamarck might have received his specimens. Swan River in Reeve's time included Shark's Bay, and Western specimens agree very closely with Delessert's figure[36] of Lamarck's species.

Queensland shells have the posterior end more rounded and the anterior end also less produced, but the Sydney shells differ from both in that they have the anterior end more produced than in either the Queensland or the Western Australian species and have the posterior end rounded as in the former. Moreover, whereas the extra-limital species are smooth, the growth lines notable but not forming separate ridges, the local shell may be described as closely minutely ridged throughout save in its early stages, leaving the umbonal area smoothish. The coloration of the dead shells is dirty white, without and within, whereas the tropical shells are colored, but in generic characters the shells otherwise agree, and are therefore placed in *Pitarina* Jukes-Browne[37], introduced with type *C. citrina* Lamarck.

The Sydney specimens are 39 mm. long by 32 mm. high, and 38·5 mm by 31·5 mm., the two valves together having a breadth of 27 mm.

[34] Tomlin.—Proc. Mal. Soc. (Lond.), xv, 1923, 310.
[35] Reeve.—Conch. Icon., xiv, Oct., 1863, pl. xi, fig. 49.
[36] Delessert.—Recueil Coq. Lamarck, 1841, plate 8, fig. 8, a, b, c.
[37] Jukes-Browne.—Proc. Mal. Soc. (Lond.), x, 1913, p. 346.

A number of species appear to plaster the outside of their shells lightly with sand grains, the Queensland "*citrina*" being one, the so-called "*prora* Conrad" of Queensland another, "*australica* Reeve" a third, and thus they lead to the very peculiar genus, *Granicorium* Hedley, the subject of the succeeding note, which covers the whole of its shell with a thick crust of sand.

Granicorium attonitum, sp. nov.

(Plate xx, fig. 17.)

In search of fish the trawlers have been exploiting the Continental Shelf north of Sydney, and Mr. W. L. Dingeldei, keeping in touch with the captains of the trawlers, has brought in many of the common species previously better known from the south. No appreciable difference has been detected in the majority of cases, giving a range of over twelve degrees of latitude. Some strangers from the north have been discovered and more are anticipated.

Mr. H. S. Mort brought in a valve procured by Captain Moller off Wattamolla just south of Sydney in 50–80 fathoms, which is of extraordinary interest, belonging to the genus *Granicorium*, founded by Hedley[38] upon a species dredged in the Capricorn Group. Hedley's largest specimen was 19 x 17 mm., but I was fortunate enough to secure in the same locality valves measuring up to 41 x 39 mm. Mr. Mort's specimen measured 32 x 29 mm., and differed very slightly in shape. Mr. Dingeldei then brought in a larger valve, also collected by Captain Moller off Shoalhaven Bight, New South Wales, in 45 fathoms. This specimen was at sight much more obese than the typical series, with a much larger lunule, and measures 43 mm. by 41 mm. with a depth of 19 mm., as against 14 mm., single valve only. But for the obesity of the shell, the good description given by Hedley is well applicable.

Katelysia enigma, sp. nov.

(Plate xx, fig. 13.)

A valve picked up by Mr. Ralph Blacket on the Manly Cove Beach is here figured; later he secured a second specimen. Since then Dr. K. K. Spence brought in two valves picked out of some dredgings from Parsley Bay, Port Jackson, and Mr. C. F. Laseron also found one at the same place. All these are dead, and it may be the species is extinct, and that these have been dug out of a layer below the normal Harbour floor. Otherwise it is very difficult to account for its discovery at this late date as it is a notable form. The specimens all agree in form, and differ from the southern species known as *K. strigosa* Lamarck[39] in their more equilateral shape and greater depth. The sculpture is very much the same, though apparently a little more regular in the local shells, but the proportions show that for the same length, 38 mm. the latter is 29·5 mm. in depth, the West Australian only 27·5 mm. The umbo in the local shell is at about the anterior third, whereas in the western shell it is at the anterior fourth. As seen in the figure the posterior end is much more rounded, the dorso-posterior side more curved.

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[38] Hedley.—Proc. Linn. Soc. N.S.W., xxxi, 1906, p. 477, pl. xxxviii, figs. 26–27, 19 Nov.
[39] Lamarck.—Hist. Anim. s. Vert., v, 1818, p. 605: King George's Sound, Western Australia.

Genus **Clementia.**

On the New South Wales list two species are included, *crassiplica* Lamarck and *papyracea* Gray, *C. strangei* Deshayes and *C. moretonensis* Deshayes respectively being given as synonyms. These two latter names should replace the two in use, as they were both described from Moreton Bay, South Queensland[40], and the local shells agree, and differ from the North Queensland species. It may be noted that only *papyracea* Gray is on the Queensland list, so these two should be reinstated.

Paratapes scordalus, sp. nov.

(Plate xx, fig. 11.)

Recent acquisitions made necessary the reconsideration of the nomination of the shell listed by Hedley as *Paphia textilis* Gmelin[41]. Gmelin's species has for its references Lister, Knorr and Chemnitz (*textrix*), and localities Malabar Coast and Red Sea. Born[42] had introduced *undulata* for Knorr, Vergn. ii, tab. 28, fig. 4 (locality unknown) years before, and this name has been sometimes used for the same species as Gmelin's *textilis*. Chemnitz [43] was not binomial when he used the name *textrix*, but that name has also been used.

An overlooked name is that given by Meuschen[44] in the Index to Gronov. Zoophyl, who, for his *Venus angulosa*, cites Lister and Gualtieri, with locality Ceylon.

Tomlin[45] has recorded that *Tapes vernicosa* Reeve is the same as *undulata* Born, but Reeve's figure does not agree in anyway with that cited by Born. In chronological order Born, 1780, locality unknown, comes first, then follows Meuschen, 1783, with Ceylon, then *textrix* Chemnitz. 1784, nonbinomial, fig. 442 only, from the Malabar Coast, and then Gmelin, 1791, for the same species citing Malabar Coast and Red Sea.

The Sydney shell may be described thus. Shell elongate, shining, smooth inequilateral. Coloration : early portion of shell pale brownish cream, then pinkish painted with closely set angulate markings of a darker shade, less pronounced medially. The early portion of the shell is smooth, but a series of wavy ridges run along the medial portion of the valve ventrally; these do not reach either end of the shell, approaching the posterior but rather distant from the anterior.

Length, 46 mm.; height, 27 mm.; depth of conjoined valves 16 mm. Type from Sydney Harbour, New South Wales.

A more boldly painted shell from North Queensland is more heavily sculptured, while a similarly colored shell from the North Coast of New Guinea is quite smooth and agrees better with Lister's figure, and might be *undulata*, the latter being also separable by shape from the Sydney shell.

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[40] Deshayes.—Proc. Zool. Soc. (Lond.), 1853, 1854, pp. 17–18.
[41] Gmelin.—Syst. Nat. pt. vi, 1791, p. 3280.
[42] Born.—Mus. Caes. Vindob., 1780, p. 67.
[43] Chemnitz.—Conch. Cab., vii, 1784, p. 48, pl. 42, fig. 442–443.
[44] Meuschen.—Index to Gronov. Zoophyl., pp. 671=271, No. 1160, 1783.
[45] Tomlin.—Proc. Mal. Soc. (Lond.), xv, 1923, p. 313.

Acritopaphia, gen. nov.

(Plate xx, fig. 12.)

Type.—*A. transfusa* sp. nov.

Hedley included in the New South Wales list, *Paphia inflata* Deshayes,[46] following Angas' determination, but Deshayes' shell came from Ceylon, and it differs in proportions and sculpture from the local shell, which is therefore here described as new.

Shell large, somewhat obese, elongate, roundly oval, anteriorly produced, posteriorly rounded, ventral margin rounded. Coloration reddish fawn, indistinctly marked with darker angulate streaks, sometimes obsolete. There is a large, smooth lunule, distinctly marked off. The earlier portion of the shell is smooth, then strong concentric ridges are developed on the shell figured amounting to twenty-five, and a few weaker ones. Internally the shell is white, the hinge small, the teeth narrow, bifid, and prominent.

Length, 59 mm.; height, 43 mm.; depth of single valve, 17 mm.

Type from Sydney Harbour, New South Wales.

I proposed to replace *Paphia semirugata* of Hedley's list by *Paratapes polita* Sowerby, but suggested dissent. It now turns out that Sowerby's name is invalid as *Venus polita* Solander is recorded by Dillwyn,[47] as a synonym of *Venus textile* Gmelin = *undulata* Born, a congeneric species. However, from specimens available, Sowerby's shell might equally be the juvenile of the present species, so that, until series of both "*semirugata*" and "*transfusa*" are compared with the type of *polita* that name cannot be utilised. In the meanwhile there are no specimens of *semirugata* in the collection from New South Wales, and it can be entirely expunged from our List.

The only other local species placed under *Paphia* is *turgida* Lamarck, and according to Jukes-Browne this would be referable to *Tapes*, but the well-known specific name seems doubtful, as Lamarck described his species from "L'Ocean des grandes indes," and he had few local shells. It appears to have been overlooked that Deshayes,[48] with Lamarck's types before him, pointed out that *Venus dorsata*,[49] described from New Holland, collected by Péron, differed in no essential manner from *turgida*, and had two pages priority. As Péron's collections were mainly western and southern Australian shells, probably *dorsata* = *turgida* is also a western Australian species.

Family **GLAUCONOMYIDAE.**

This family is included in Hedley's New South Wales list, with the genus *Glauconomya*, and the species *G. angulata* Reeve. A curious series of complications is revealed upon investigation, as *Glauconomya* was credited to Bronn,[50] where it is found to be a *nomen nudum* without explanation. The earliest valid publication appears to be in Potiez and Michaud.[51] where the name is credited to Gray, with Gray's one species. Gray[52] had proposed *Glauconome* for the species *G. chinensis*

[46] Deshayes.—Proc. Zool. Zoc. (Lond.), 1853, p. 8, pl. 19, fig. 3, 1854.
[47] Dillwyn.—Descr. Cat. Rec. Shells, 1817, p. 204.
[48] Deshayes.—Hist. Anim. s. Vert. (Lam.), ed. 2, vi, 1835, p. 350, footnote.
[49] Lamarck.—Hist. Anim. s. Vert., v, 1818, p. 593.
[50] Bronn.—Lethaea Geogn., 1838, p. 807.
[51] Potiez and Michaud.—Gal. Mol. de Douai, ii, 1844, p. 193.
[52] Gray.—Spicil. Zool., 1828, p. 6.

from China, and this name has been rejected as anticipated by Goldfuss in 1826, and thus *Glauconomya* came into use. Sherborn has now given us the date of Goldfuss's introduction[53] as being 1829, and thus Gray's *Glauconome* must come back into use.

Glauconometta plankta, gen. et. sp. nov.

(Plate xx, fig. 16.)

Shell small for the family, thin, inequilateral, posteriorly beaked, equivalve, covered with a rather coarse periostracum, eroded at the umbones. Hinge rather strong, cardinals three, anterior largest and strongly bifid, no laterals. The pallial sinus is short, but deep and narrow, with a truncate tip. The external ligament is large and prominent. The anterior end is rounded, the posterior somewhat obliquely truncate, an ill-defined angle leading from the umbones to the lower angle, the ventral edge broadly rounded, subparallel to the dorsal.

Length, 26 mm.; breadth, 14 mm.

Habitat.—New South Wales. Type from Parramatta River, Sydney Harbour.

Genus **Tellinota,** nov.

(Plate xx, fig. 18.)

Type.—*T. roseola* sp. nov.

The Tellinids have been subdivided into groups, but the fine shell known as *Tellina abinella* Lamarck has not yet received a place. As the type of *Tellina radiata* Linné, is an American shell nothing like our species, that name cannot be used; *Angulus* Megerle may come into use for Hedley's *astula*, but cannot include this; *Tellinella* Gray may be available for the *virgata* Linné series which differs, so that the new genus *Tellinota* is proposed as above.

Shell fairly large, elongately oval, beaked, flattened, almost equilateral, a little inequivalve, surface partly striate, partly smooth, teeth weak, laterals distant, pallial sinus extremely large, running subparallel to the dorsal margin.

Coloration practically always rose, the beak and one-third of the remainder coarsely striate, all medium portion smooth and shining, finely striated at the anterior end.

Length, 65 mm.; height, 36 mm.

Habitat.—New South Wales. Type from Byron Bay.

Pristipagia gemonia, gen. et. sp. nov.

(Plate xxi, fig. 6.)

The common Queensland shell known as *Tellina capsoides*[54] was provided by Jousseaume[55] with a new (!) generic name *Pristis,* but that name was not new in any sense having been given to a Sawfish[56] many years before.

A curious little shell recalling *Pseudarcopagia botanica* was sorted out of the "Triton" dredgings, but upon investigation was found to be a small degenerate ally of the northern *capsoides.*

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[53] Goldfuss.—Petref. Germ., i, (2), 1829, p. 100.
[54] Lamarck.—Hist. Anim. s. Vert., v, 1818, p. 531.
[55] "Jousseaume."—Lamy, Bull. Mus. Nat. Hist. Nat., 1918, pp. 24–29.
[56] Linck 1790, Latham 1794, Muller and Henle 1837, cf. Sherborn.

Shell small, thin, glassy, white, closely concentrically lirate, no radial striæ, almost equilateral, strongly beaked. The hinge is strong, the cardinals prominent and the laterals large and widely separated, the external ligament small, a little sunken. The pallial sinus runs from muscle to muscle, subparallel to the dorsal angle of the shell.

Length, 18·5 mm.; height, 15 mm.

Habitat.—New South Wales. Type from Sydney Harbour.

Pinguimacoma hemicilla, gen. et. sp. nov.

(Plate xxi, fig. 7.)

Superficially this little shell recalled *Pinguitellina*, but upon examination was found to have no lateral teeth, a character of some importance. Shell small, thin, pinkish-white, inequilateral, a little swollen, smooth, growth lines showing only towards the ventral margin. The short beak is also smooth, and the hinge shows only cardinal teeth; the pallial line appears to agree with that of *Pinguitellina*, but is difficult to observe owing to the thinness of the shell. This is another of the forms which suggest that the loss of lateral teeth is recent, the hinge ligament probably compensating for this loss. From the species of *Pinguitellina* this little shell is separable externally by the short beak and more swollen anterior portion.

Length, 11 mm.; height, 9 mm. Type from Sydney Harbour "Triton" dredgings.

Habitat.—New South Wales.

Family **CORBICULIDAE.**

(= **Cyrenidae olim.**)

Master Consett Davies some years ago brought back from the Richmond River, northern New South Wales, a valve of a *Batissa*, which I now record as *Batissa australis* Deshayes[57] (plate xx, fig. 5), so that it may be looked out for. It is also probable that *Geloina* (olim *Cyrena*) may occur in northern New South Wales. The two genera occur together in Queensland, and can be separated by the striated lateral teeth of the *Batissa*.

The local valve measures 70 mm. in length, 57 mm. in height and 18 mm. in depth, and is rather regularly oval, less angulately, posteriorly than in northern specimens, with the cardinals placed together. Interiorly there is a violet tinge very characteristic of the group; this is entirely missing in the shells of the *Geloina* (=*Cyrena*) series.

Milligaretta venta, gen. et. sp. nov.

(Plate xxi, fig. 8.)

Hedley[58] introduced the usage of the name *Psammobia lessoni* Blainville for the species previously known as *P. malaccana* Reeve, but indicated that the local shell differed, while Smith[59] many years before had observed that it should be generically named as it possessed lateral teeth. Shell of medium size for the family, transverse oval, almost equilateral, anteriorly rounded, posteriorly obliquely truncate. Coloration bluish-white with purplish rays, internally reddish-purple.

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57 Deshayes.—Proc. Zool. Soc. (Lond.), 1854, 1855, p. 346.
58 Hedley.—Proc. Linn. Soc. N.S.W., xxix, 1904, p. 196.
59 Smith.—Rep. "Challenger," Zool., xiii, p. 93, 1885.

The sculpture consists of spaced concentric fine ridges smoothened anteriorly; with growth these change altogether, the posterior ridges vanishing, leaving a smooth area and the anterior developing strongly and angulately transversing the shell. The two bifid cardinal teeth are small and weak, laterals obsolescent in the Sydney specimen.

Length, 29 mm.; height, 14 mm. Type from Sydney Harbour.

Habitat.—New South Wales.

Genus **Flavomala,** nov.

Type—*Solen biradiatus* Wood.

Under the generic name *Soletellina*, two species appear in the Check List, *biradiata* Wood and *florida* Gould. In the first place these cannot be regarded as congeneric, and in the second, *florida* Gould is invalid, and neither can be referred to *Soletellina*. The former has been cited under the later name *flavicans* Lamarck as the type of *Psammotella* Blainville, by Kobelt[60], who added that the type of *Psammotella* Deshayes was *Soletellina philippinensis* Deshayes. However, Blainville[61] did not use the Latin form, but only the French vernacular Psammotelle, and the first to latinise the word seems to be Herrmannsen[62], who gave as the only species *Tellina rufescens* Chem. Curiously enough, this species was excluded by Blainville, though that does not concern us much. The type of *Soletellina* is *diphos*, a long beaked shell, while *biradiata* has no beak at all, but is fairly regularly ovate. The new genus, *Flavomala* (plate xx, fig. 19) is proposed, as *Psammotella* is unavailable. The smaller species, known as *florida* Gould, differs in texture and form, the umbo being much nearer the anterior end, and the teeth being more delicate. The new genus *Florisarka* is introduced, and the new specific name *F. onuphria* given to the type (Plate xx, fig. 14.) Shell of medium size, transversely oval, thin, covered with a thin periostracum. Coloration purplish, the periostracum brownish, the umbones worn whitish, internally purple with whitish blotches, rays obscurely seen externally. The hinge is very small and weak, with two small cardinals and no laterals, but supported by a strong external ligament. The pallial sinus is long and broad, reaching well past the middle of the shell. The umbo is nearly median, the dorsal margin a little angulate, the ventral almost straight. The anterior end is rounded and the posterior is a little truncate but also rounded. The foot is short, thick, and angulately spade-shaped, the siphons long, the inhalent very long and thicker, the orifices plain.

Length, 33 mm.; height, 19 mm. Habitat—New South Wales. Type from Manly Lagoon.

Distugonia, gen. nov.

(Plate xxi figs. 9, 9a.)

Type.—*D. inopinata* sp. nov.

A genus recalling *Tugonia*[63] and *Tugonella*[64], the latter based on *divaricata* Reeve [65] which Jousseaume regarded as different from *elliptica* A. Adams, but which Lamy considered to be the same.

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[60] Kobelt.—Illus. Conchyl., p. 328, 1881.
[61] Blainville.—Dict Sci. Nat. (Levr.), Vol. 52, 1828, p. 541.
[62] Herrmannsen.—Index Gen. Malac., Suppl., Dec., 1852.
[63] Gray.—Recluz, Rev. Zool., ix, 1846, (May), pp. 168, 174.
[64] Jousseaume.—Le Naturaliste, 13th year, p. 202, 1891.
[65] Reeve.—Conch. Icon., xiv, pl. 1, f. 2, February, 1863 : Ceylon.

Shell small, thin, very swollen, tapering posteriorly where the shell gapes. Shell limy white, the only sculpture being rather strong growth lines. The umbonal area shows a small rather regular oblong oval shell, which develops and swells posteriorly, while the anterior end becomes comparatively more compressed ventrally but does not close. There are no laterals, but medially a large irregular spoon-shaped process is developed carrying the ligament into an internal socket. There is a shallow curved pallial sinus.

Length, 21 mm.; height, 16 mm.; depth of conjoined valves, 15 mm.

Habitat.—New South Wales. Type from Sydney Harbour dredgings.

Ensiculus hilaris, sp. nov.

(Plate xx, fig. 15.)

For the species included in the check list under the name *Cultellus cultellus* L. the name *Ensiculus hilaris* is proposed. *Cultellus* was introduced by Schumacher[66] for his *C. magnus* = *Solen lacteus* Spengler, which is very different from *Solen cultellus* Linné which H. Adams[67] separated under the generic name *Ensiculus* which should be used. Linné's *cultellus* has for its first reference "Rumph" and Amboina as the locality, and Dunker[68] even separated the Port Essington shell as distinct from that. Sowerby[69], notoriously careless in the discrimination of species, ranged Dunker's species as a synonym of the Linnean one.

The local shell is more rounded anteriorly and more attenuate posteriorly than the northern one.

The type from Sydney Harbour measures 59 mm. long by 18 mm. high.

Family **TEREDINIDAE.**

Hedley recognized only two species in his New South Wales check list, *edax* Hedley and *saulii* Wright, both under the generic name *Nausitoria.* An intensive investigation into the boring organisms attacking harbour piles in Port Jackson carried out by Messrs. Roy Johnson, F. McNeill and myself during the past five years resulted in the recognition of many species in this locality alone. A report has been published by the Sydney Harbour Trust[70], and in it the following species were described and figured, all from Sydney Harbour:—*Teredo austini* Iredale (p. 29, pl. i, figs. 1–4); *Teredo shawi* (p. 30, pl. i, figs. 5–8); *Teredo balatro* (p. 31, pl. ii, figs. 4–7); *Teredo pertingens* (p. 31, pl. ii, figs. 8–11); *Nototeredo edax* Hedley (p. 32, pl. ii, figs 1–3); *Nototeredo remifer* Iredale (p. 32, pl. iii, figs. 1–4); *Bankia debenhami* (p. 34, pl. iii, figs. 5–8); *Bankia rosenthali* (p. 35, pl. iii, figs. 9–12); *Bankia archimima* (p. 35, pl. iv, figs. 5–8); *Bankia occasiuncula* (p. 36, pl. iv, figs. 1–4); and *Nausitora messeli* (p. 37, pl. iv, figs. 9–12).

The subgenera *Pingoteredo* (p. 30) with type *Teredo shawi* Iredale, *Deviobankia* (p. 33) with type *Bankia debenhami* Iredale, and *Inequarista* (p. 37), with type *Nausitora messeli* Iredale, were also introduced. A subgenus *Dicyathifer* was also proposed for the Queensland shell known as *Nausitora mannii* Wright as determined and figured by Calman.

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[66] Schumacher.—Essai nouv. Syst. Test., 1817, pp. 43, 130.
[67] H. Adams.—Proc. Zool. Soc. (Lond.), 1860, 369.
[68] Dunker.—Proc. Zool. Soc. (Lond.), 1861, 423, 7 April, 1862.
[69] Sowerby.—Conch. Icon., (Reeve), xix, 1874, pl. vi, fig. 28
[70] Iredale, Johnson and McNeill.—Destr. Timber by Marine Organisms, 1932, pp. 24–40, pls. i–iv, 5 text figs.

Notohaliotis ruber Leach.

The invalidity of Martyn's names causes a complication in the case of *Haliotis naevosum*, and it becomes doubtful whether the name can be retained. Gmelin introduced *Haliotis gigantea* from Chemnitz, who confused Japanese and Australian species and synonymised Martyn's plate, giving only New Holland as a locality. The confusion was continued until Deshayes[71] separated the two, allotting *naevosa* to our shell but crediting it to New Zealand. In the meanwhile, however, Leach[72] had described and figured *Haliotis ruber* from New Holland, obviously the Sydney shell.

Cotton and Godfrey[73] have recently subdivided the South Australian *Haliotis* into subgenera, proposing *Notohaliotis*, with type *H. naevosa* Martyn. Their name is here used generically, as there is no definite usage of *Haliotis* yet settled, but in any case it will be inapplicable to this group.

Minolops gertruda, sp. nov.

(Plate xxi, fig. 11.)

Among some shells brought in by Mr. W. L. Dingeldei, collected by Captain Moller from off Cape Hawke, northern New South Wales, in 45–50 fathoms, was this new *Minolops*, a very unexpected find. It recalls *emendata* Iredale, but is more conical, with a narrower umbilicus, the base more strongly concentrically corded and lacks the strong radial threads.

Shell depressedly conical, broader than high, mouth very large, spirally striate throughout. Coloration pale dirty pinkish fawn, flamed with dull crimson, the flames persisting on to the base but not into the umbilical area. On the penultimate whorl seven liræ can be counted below the shoulder, but on the last whorl the subordinate threads increase at the expense of the liræ so that the whole of the whorl is concentrically threaded, even the shoulder, and a dozen or so major threads can be distinguished.

Height, 6·5 mm.; breadth, 10 mm.

Habitat.—New South Wales.

Benthastelena, gen. nov.

(Plate xxi, fig. 12.)

Type.—*B. katherina* sp. nov.

Suggesting itself as a deep water representative of *Astelena*, this genus differs at sight in the absence of the umbilicus. Thiele[74] has dismissed the genus *Astelena* because the name reads like *Astele*, a very unscientific procedure, as I had pointed out that there was no real relationship between the two. The present form has also probably little real affinity with *Astelena*, but the general facies suggests that genus.

Shell small, regularly trochoid, imperforate. Coloration deep brownish-fawn, the apical whorls darker (probably animal seen through thin shell), and the base much paler. The apex has the usual raised, rather tilted, smooth initial whorl,

[71] Deshayes.—Hist. Anim. sans Vert. (Lam.), 2nd ed., ix, 1843, p. 34.
[72] Leach.—Zool. Miscell., i, 1814, p. 54, pl. xxiii.
[73] Cotton and Godfrey.—South Austr. Nat., xv, 1933, p. 16, 30 November.
[74] Thiele.—Handb. syst. Weicht., i, 1929, p. 49.

succeeded by the adult sculpture, which begins as two strong concentric keels cut into nodules by longitudinal ribs. Almost immediately the upper row increases its nodulation into triangular projections, the lower one on the other hand almost decreasing in strength, which it actually does on the later rows. There are seven adult whorls, and the last one has two strong keels, the upper one encircling the periphery and developing about a dozen triangular subspinose nodules. The lower one has a plain keel, but in between there is a finely crenulated keel, the remains of the original second keel; on each side of it is a spiral thread. The shoulder shows seven fine liræ, two of them larger and nodosely crenulate, four others finer and finely crenulate, but the seventh, the one above the peripheral spinose keel, is quite plain. On the base fifteen flattened liræ can be seen, finely threaded between with growth striæ; the four surrounding the umbilical depression are crenulate, the others plain. The outer lip is thin, the columella a little curved and forming an angular tip with the aperture, the inner lip reflected, entirely closing the umbilicus.

Height, 12 mm.; breadth, 11 mm.

Type from 110 fathoms east of Sydney.

Habitat.—New South Wales. On the Continental shelf, in the deeper water.

The only other deep water Trochoid on our list is the *Trochus glyptus* Watson[75], which Hedley at last located under *Solariellopsis*, but it appears to be really a deep water derivative of the true *Astele*, though obviously generically distinct, and is here named *Mazastele*, the sculpture being very beautiful, and the sutures sunken instead of being shouldered, the umbilicus being also proportionately much wider.

Ninella torquata Gmelin.

The rejection of Martyn's names necessitates a change in the usage for the extraordinary but common Sydney shell listed by Hedley as *Turbo stamineus*. Erroneously recorded from New Zealand by Martyn, it also appeared in the Portland Catalogue from that locality under the name *Turbo singularis*, " remarkable for the singular shape of its operculum," and Humphrey, in the Mus. Calonn., continuing this specific name, gave the correct locality " Port Jackson, New South Wales " from information received by the early colonists here. Gmelin had, however, named *Turbo torquatus*, citing Martyn's plate, and also referring to Chemn. conch., 10, p. 295, 6, vign. 24, f. AB. This specific name must therefore be used, and the generic name *Ninella* Gray[76] proposed for it alone will be available, so that *Ninella torquata* Gmelin will replace *Turbo stamineus* Martyn, while Thiele (Handb. syst. Weicht, i, p. 68, 1929) has introduced *Subninella*, naming *T. undulatus* Martyn (= *undulatus* Solander) as type.

Partubiola, gen. nov.

(Plate xxi, fig. 13).

Type.—*P. blancha* sp. nov.

Tubiola was introduced by A. Adams[77] for a series of tropical shells, of which the type was fixed by Kobelt[78] as " *nivea* Ch," but of which the type is given by Thiele[79] as *cornuella* A. Adams, and the genus is cited as a questionable section of

[75] Watson.—Rep. Zool. "Challenger," xv, 1886, p. 75, pl. 6, fig. 6.
[76] Gray.—Figs. Moll. Anim., iv, 1850, p. 87.
[77] A. Adams.—Proc. Zool. Soc. (Lond.), 1863, p. 74.
[78] Kobelt.—Illustr. Conchylienbuch, 1878, p. 154.
[79] Thiele.—Handb. syst. Weicht., i, 1929, p. 60.

Skenea Fleming, a genus of small British shells, an extraordinary association. Specimens recalling the form of *nivea* have been collected in Queensland, though not yet on record, but a beautiful little shell of similar facies was picked out of the harbour dredgings, and upon critical examination is named as above.

Shell small, discoidal, glassy, spire flattened, widely umbilicate, white. The apex is remarkable, being small and glossy, but consisting of about three whorls of turbinate form, and ending in a varix; there are about three adult whorls with a regular sculpture of spiral liræ, the interstices being threaded with fine growth striæ. These liræ number seven or eight on the penultimate whorl, the suture deep, and on the last whorl sixteen can be counted, of which six are on the base, the last one bounding the umbilical cavity which is large, funnel-shaped, and shows only spiral threads crossed by rather strong growth striæ. The aperture is a little oblique, and the outer lip recedes rather rapidly and sinuously to meet the columella, which curves upward, and makes a thick glaze across the body whorl to meet the lip again.

Major diameter, 5·25 mm.; minor diameter, 4·75 mm.; height, 2 mm.

Habitat.—New South Wales. Type from Sydney Harbour dredgings.

Liotina scalaris Hedley.

(Plate xxi, fig. 15.)

Hedley[80] named a *Liotia tasmanica* var *scalaris* from off the Crookhaven River, 11–15 fathoms, but did not figure the specimen, as the mouth was imperfect. His specimen is now figured, as it is a distinct species, another specimen having been found, also with the mouth incomplete, in 110 fathoms east of Sydney, agreeing in all essential features.

Larinopsis ostensus, sp. nov.

(Plate xxiv, fig. 17.)

Twenty-five years ago Gatliff and Gabriel[81] described a very strange marine shell dredged from five fathoms in Western Port, Victoria, as *Larina* (?) *turbinata*. As *Larina* was a freshwater genus, Hedley deferred to this location, and suggested the marine genus *Pellilitorina*. The authors of the species rightly objected to this transfer, and proposed instead a new genus *Larinopsis*[82], but without indicating any family.

Mr. W. L. Dingeldei brought in a beautiful shell trawled by Captain Moller in 65 fathoms off Jervis Bay, New South Wales, and this provides a second species of the genus, an addition to our list. Unfortunately the animal had decayed before it was received, and the operculum was lost, so that there are no further characters to add to the original description.

Shell of small size, turbinate, uncoiled, thin, transparent, white. Whorls five, the apical one small, incurved, smooth, the succeeding ones showing deep suture which separates after the second adult whorl, the next three being quite free. Only fine growth striæ can be seen. The aperture is a little irregularly circular, the thin edges even a little reflected.

Height, 17 mm.; breadth, 15 mm.

Habitat.—New South Wales. On the Continental shelf.

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[80] Hedley.—Austr. Mus. Mem., iv, 1902, p. 336, 29 July.
[81] Gatliff and Gabriel.—Proc. Roy. Soc. Vict. (N.S.), xxii, p. 35, pl. xiii, Sept., 1909.
[82] Gatliff and Gabriel.—Proc. Roy. Soc. Vict. (N.S.), xxix, p. 104, Oct., 1916.

Thiele[83] has placed this genus under *Megalomphalus* in the family Fossaridæ, with which it has apparently nothing whatever to do either as to conchological characters or anatomical features. His taxonomic work is just as unsatisfactory, as he includes the family in his " Stirps Amaltheacea " using a family Amaltheidæ based on the genus *Amalthea* Schumacher 1817, though Schumacher's name had been shown to be invalid many years ago[84].

Genus **Smaragdista,** nov.

(Plate xxi, fig. 14.)

Type.—*S. tragena* sp. nov.

A not uncommon shell among the " Triton " dredgings from Sydney Harbour was a second species of " *Neritina*," which I left as " *Neritina rangiana* auct "[85] noting that I would attend to its correct naming later.

Baker[86] did not mention it specifically, but under *Smaragdia* he gave as range " West Indies; Mediterranean; Indo-Pacific ? " the last locality apparently referring to this and allied species. Thiele, lumping through lack of local knowledge and conditions, has given a figure of the radula of " *rangiana* Recluz " as typical of *Smaragdia*, contending that the radular distinctions given by Baker for *Smaragdella* are worthless. However the shells are distinctly separable, and I therefore propose the new generic name *Smaragdista* for the new species *S. tragena* described as follows.—

Shell very small, globose, spire a little elevated, imperforate.

Coloration.—Bands of squarish blotches and separate longitudinal marks arranged in parallel, encircling the whorls and sometimes massing into continuity towards the mouth. Ground color generally white or pinkish, the blocks and bands pink and purple. There are no longitudinal streaks so characteristic of *Smaragdella.*

The apical whorl persists as a small glassy tip, then of the next three whorls the first is wound almost planately, the last descending rather rapidly. The whole surface smooth and shining, showing faint growth lines under the lens. Aperture semicircular, outer lip thin, columella straight, with eight small irregular teeth placed medially, the inner lip spread as a heavy smooth glaze almost as large in area as the aperture.

Height, 7 mm. : width, 6 mm.

Habitat.—New South Wales. Type from Sydney Harbour.

A dead specimen of the " *oualanensis* Lesson " series was also found, but as it is a very common and attractive shore species of North Queensland, the species will not be admitted without confirmation. It was included by Baker in his *Vittoclithon* introduced for *N. meleagris* Linné of the West Indies, but Baker remarked upon the notable differences in the radula. The new generic name *Pictoneritina* is introduced, the species *N. oualanensis* Lesson being named as type. The columellar dentation is very irregular and obscure and the painting consists of streaks.

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[83] Thiele.—Handb. syst. Weicht., i, 1929, p. 239.
[84] Iredale.—Proc. Mal. Soc. (Lond.), ix, 1911, p. 263.
[85] Iredale.—Rec. Austr. Mus., xviii, 1931, p. 210.
[86] Baker.—Proc. Acad. Nat. Sci. Philad., xxv, 1923, p. 173.

Cellana tramoserica Sowerby.

Comparatively recently the limpet known as *Patella tramoserica* was discussed fully by Hedley[87], and it was clearly shown that Martyn's *tramoserica* was not the common Sydney shell, but that Chemnitz later used the name for our species. Thereupon Martyn's name was rejected, and Blainville's *variegata* brought into use. The disqualification of Martyn as a binomialist allows the recognition of any later use of the name *tramoserica*. Chemnitz was also not a binomialist, but Sowerby[88] legalized the use of Chemnitz's name prior to Blainville's introduction of *variegata*. Consequently reversion to *tramoserica* seems certain, and the only change will be the use of *Cellana* in place of *Patella* or *Helcioniscus*.

Bembicium nodulosum Gray.

This was given as the name to be used for the Harbour or Mangrove form of *Bembicium*, and it was figured under that name by Musgrave[89] upon my recommendation. Upon re-investigation the name *nodulosum* proved to be a pure *lapsus*, and its first publication appears to have been in Musgrave's article as above cited. There appears however to be a valid earlier name which has not been used, but whose right seems indisputable. In the Zoological Report of the Novara Mollusca a *Risella kielmannseggi* was named and figured by Frauenfeld[90], having been previously described by Zelebor. Apparently Suter[91] had not access to this account as he cited the name as a synonym of *Astraea sulcata* subsp. *davisii* Stowe, though it had priority, and was localised from New Zealand. Had Suter been able to see the figure he would certainly have rejected the name. The " Novara " called only at Sydney, New South Wales, and Auckland, New Zealand, in our waters. The " Novara " figure is an excellent one of our shell, and is nothing much like the young of the Neozelanic " *Astraea*," *i.e.*, *Cookia*. The " Novara " naturalists collected in Botany Bay where they could easily get this species, which must now be called *Bembicium kielmannseggi* Zelebor.

Family **FOSSARIDÆ**.

Hedley[92] placed in this family a species he described as *Fossarus sydneyensis*, and gave an excellent figure. Our species lives under stones at Long Reef, near Manly, New South Wales, and is obviously not congeneric superficially with the Palaearctic true *Fossarus*. It would be better placed in the family Siriidæ. A new generic name *Anafossarus* is introduced for this species alone, and it will be later studied in detail. It recalls some of the shells placed under *Couthouyia*, showing an umbilical chink, but is much more solid.

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87 Hedley.—Proc. Linn. Soc. N.S.W., xxxix, 1914, (1915), p. 714.
88 Sowerby.—Cat. Shells Tankerville, 1825, p. 30, January.
89 Musgrave.—Austr. Mus. Mag., iii, 30 April, 1929, p. 344, fig. in text.
90 Frauenfeld.—Reise Novara, Moll., p. 9, pl. 1, fig. 11.
91 Suter.—Man. New Zeal. Moll., 1913, p. 168.
92 Hedley.—Proc. Linn. Soc. N.S.W., xxv, 1900, p. 89, pl. 3, fig. 12.

Genus **Diffalaba**, nov.

(Plate xxi, fig. 16.)

Type—*D. opiniosa* sp. nov.

Shell small, elongate, thin, ten-whorled, whorls a little rounded, subvaricose, striate, mouth oval, outer lip thin, columella sinuate, imperforate. Coloration of dead shell white with a few brown streaks. Varices irregular and showing as raised rounded ribs only. The sculpture is really fine grooves with flat-topped liræ, about six on the penultimate whorl and fifteen on the last whorl.

Length, 5·5 mm.; breadth, 2 mm.

Habitat.—New South Wales. Type from Sydney Harbour dredgings.

This looks like an elongated "*Diala*," as the name is used in Australia, but that name covers two or three distinct groups. *Alaba* was once used for similar shells, but is now restricted to American shells like the type. Thiele[93] has figured a shell as the type of *Alaba*, *A. melanura* C. B. Adams, which does not seem like the original species.

Genus **Ataxocerithium.**

Under the generic name *Ataxocerithium* Hedley allowed only one species, *serotinum*, ranging *rhodostoma* as a synonym. A. Adams[94] described *Cerithium serotina* from Van Dieman's Land following it with *Cerithium rhodostoma* from unknown locality (fig. 103). The former was elongate with reticulate sculpture, mouth expanded, canal open, with little reflection of inner lip, while the latter was smaller and broader, sculpture coarser, mouth less expanded and canal still open. Whether these are identical or not, two corresponding forms occur throughout New South Wales, one elongate like *serotina*, with much finer sculpture, inner lip much expanded and the canal closed; the other broad like *rhodostoma*, with even finer sculpture and inner lip and outer lip still more expanded, and of shorter growth with fewer whorls.

These, when trawled, show different apices, and constitute a neat problem in the study of protoconchs, as apart from the essential differences seen the shells appear to coincide in every general feature.

Ataxocerithium conturbatum, sp. nov.

(Plate xxi, fig. 17.)

Among the "Triton" dredgings in Sydney Harbour were found specimens of a long delicate *Ataxocerithium* which is here described. Shell elongate, narrow, very finely sculptured reticulately, many whorled (thirteen adult whorls) mouth subcircular, canal closed. Coloration cream. Apical whorls four forming a long glassy protoconch succeeded by longitudinal and spiral ribs developing into a fine reticulation. The antepenultimate whorl shows two main spiral ribs with about four subsidiary ones crossed by about twenty longitudinals forming nodules at their intersections. The nodulation becomes obsolete on the last whorl and is missing

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[93] Thiele.—Handb. syst. Weicht., i, 1929, p. 210.
[94] A. Adams.—Thes. Conch. (Sow.), ii, 1855, pl. clxxx, fig. 102.

on the base, where five flat liræ with striated interstices only exists. The columella is straight, the inner lip erected as an upstanding flange, a thick glaze crossing the body whorl to meet the outer lip, which extends in a circle to meet the columella and close the short slightly recurved canal.

Length 16 mm.; breadth 6.5 mm. Type from Sydney Harbour.

Habitat.—New South Wales.

Ataxocerithium scruposum, sp. nov.

(Plate xxi, fig. 18.)

Shell elongate, thin, resembling the last described, but with the longitudinals fewer and more pronounced and with more tendency to the pagoda-like form seen in the next species. The apical whorls are about three and a half, thin, glassy, the protoconch long and attenuate, the succeeding ones reticulate, the longitudinals more prominent. On the antepenultimate there are about sixteen longitudinals crossing about four major spiral cords with a couple of minor ones below the suture, the nodulation being less marked.

Length, 12 mm.; breadth, 6 mm. Type from 70 fathoms off Green Cape.

Habitat.—New South Wales. All along the Continental Shelf.

Ataxocerithium applenum, sp. nov.

(Plate xxi, fig. 19.)

Shell very similar to the two preceding but shorter and notably broader, the apex consisting of one tumid whorl with the tip incurved and with only ten succeeding adult whorls. The whorls overhang each other a little, giving a pagoda-like effect, while the base is flattened. The longitudinals are more notable as in the preceding case, but in almost every detail of sculpture, form of mouth, columella, there is agreement with the two former species.

Length, 14 mm.; breadth, 7 mm. Type from 70 fathoms off Green Cape.

Habitat.—New South Wales. All along the Continental Shelf.

The occurrence of these species with different apical whorls is interesting, and needs careful investigation, but as protoconch features are regarded as of great importance, this form is made the type of a new subgenus, *Geminataxum*, to keep the matter under review.

Pyrazus ebeninus Bruguière.

When Hedley[95] discussed the name for the famous Sydney Whelk, he concluded that Martyn's name *Clava herculea* should be used, but as now Martyn's names are to be rejected, the previously used name *ebeninus* Bruguière will be revived. The generic name *Pyrazus* will, however, be continued for this species alone.

Finlay[96] has published my notes about Neozelanic and Australian species of *Cerithidea*, introducing *Zeacumantus* for *subcarinata* Sowerby, of which *tricarinata* Hutton is a synonym, and recording it from Freshwater, near Manly, New South

[95] Hedley.—Proc. Linn. Soc. N.S.W., xxx, 1905 (1906), p. 520.
[96] Finlay.—Trans. New Zeal. Inst., lvii, (23 Dec., 1926), p. 380.

Wales. This is an extraordinary addition to our fauna, as the Neozelanic species appears to have established itself in our waters without any record of its introduction. It is now certainly acclimatized, though it must have reached here only in recent years, as Angas, Brazier, Hedley and others did not collect it.

Zeacumantus includes the Tasmanian *diemenensis* Quoy and Gaimard, but not *australis* Quoy and Gaimard, which is here made the type of a new genus, *Velacumantus*. This genus differs in size and shell features, the mouth being more compressed, both canals less pronounced, and the inner lip not produced over the body whorl. *Cerithium alternatum* Hutton[97] is not Neozelanic, but was based on a shell of this species.

The other species classed by Hedley under *Pyrazus*, *anguliferus* Sowerby, must be rejected, the species apparently being based upon an immature *P. ebeninus*.

Thiele[98] has proposed *Batillariella* for the South Australian *Bittium estuarinum*, and Cotton[99] has since introduced *Paracerithium* for *B. lawleyanum* Crosse, but *Paracerithium* had been used a long time before by Cossmann.[100]

Gazameda decoramen, sp. nov.

(Plate xxi, fig. 20.)

Shell elongate, apex small and attenuate, base comparatively broad. Coloration pale red-brown, the keels white, marked with pale red-brown blotches. Apical whorls and succeeding four, white, the apex consisting of two whorls, the tip inverted, smooth, the four succeeding whorls also smooth. Then the adult sculpture begins with a subsutural ridge and a peripheral stronger one, the intervening space finely concentrically striate and marked by curved growth lines. On the tenth adult whorl, the largest I have, the periphery is girdled with two rounded ridges, and the flattened base is rather coarsely spirally striate. The columella is a little curved, ending in a pseudo-gutter, the aperture rather square, the outer lip thin, deeply sinuate.

Length, 18 mm.; breadth at base, 6·5 mm.

Habitat:—Continental Shelf of New South Wales. Type from 65–70 fathoms off Sydney.

Also, as far north, has occurred *Ctenocolpus australis diffidens*, which I[101] described from off Gabo Island, Victoria.

Sirius meracus, sp. nov.

(Plate xxi, fig. 21.)

The genus *Sirius* was erected by Hedley[102] for a shell described as *Raulinia badia* by Tenison-Woods.[103] I[104] have introduced two curious shells from the Harbour dredgings as *Opposirius idoneus* and *Dolichosirius cupiens*, and suggested a family Siriidæ to include these. I now add a second species of the genus *Sirius* from the

[97] Hutton.—Cat. Marine Moll. New Zeal., 1873, p. 26.
[98] Thiele.—Handb. syst. Weicht., i, 1929, p. 209.
[99] Cotton.—Rec. South Aust. Mus., iv, 1932, p. 539.
[100] Cossmann.—Bull. Soc. Géol. France, ii, 1902, p. 173.
[101] Iredale.—Rec. Austr. Mus., xiv, 1925, p. 267, pl. xliii, fig. 17.
[102] Hedley.—Proc. Linn. Soc. N.S.W., xxv, 1900, p. 88.
[103] Tenison-Woods.—Proc. Linn Soc. N.S.W., ii, 1876, p. 264.
[104] Iredale.—Rec. Austr. Mus., xviii, 1931, pp. 210–211.

Continental Shelf, and further find that in this case there is a notable geographic variation. The species is easily distinguished from the type by its smaller size, its more pronounced sculpture, and its narrow umbilical fissure.

Shell four-whorled, small, delicate, turbinoid, the minute apex inverted.

Coloration pale fawnish-white, chalky white after death. The apical whorls start off with keels. Four are clearly seen on the second whorl, which becomes shouldered; on the third whorl the shoulder shows a couple of threads with four strong keels, the whole closely, longitudinally, obliquely threaded; while on the base there are half a dozen weaker keels, a narrow umbilical fissure, and a rather strong columellar nodule basally. Outer lip thin, anterior canal only indicated.

Height, 4·5 mm.; breadth, 2·5 mm.

Habitat.—Continental Shelf of New South Wales. Type from 70 fathoms off Green Cape.

Specimens from 100 fathoms off Port Macquarie are shorter and broader, the liræ stronger, three on shoulder, all overridden by growth striæ sinuously, canal more pronounced and umbilical chink less developed. The type measures 4 mm. x 3·5 mm., and may be called *S. m. desponsus* subsp. nov.

Specimens from 100 fathoms off Cape Pillar, South Tasmania, are larger, much more elate, with the sculpture much more defined, the longitudinal striæ being well-marked, and the spirals very distinct, umbilical chink smaller. The type measures 6 mm. x 4·5 mm., and is here named *S. m. chrestus* subsp. nov.

At the last moment Master John Laseron brought in a shell dredged in North Harbour, Port Jackson, which is of great interest as being the first representative of the debated *Separatista* group from New South Wales. It differs decidedly from *S. gabrieli* Pritchard and Gatliff, and is much more like, and intermediate between *Trichotropis gracilenta* and *tricarinata* Brazier[105] from Torres Straits, later figured by Hedley.[106] The former measured 5·5 mm. by 2·75 mm., and the latter 5·5 mm. by 4·5 mm., while the Sydney shell measures 5·5 mm. by 3·75 mm., with the mouth attingent, not free as in the lastnamed. It may be named *Separatista fraterna* sp. nov.

Genus **Halotapada,** nov.

(Plate xxi, fig. 22.)

Type.—*H. nubila* sp. nov.

This strange little shell has somewhat the appearance of a dead *Succinea*, but shows a marked umbilical chink, recalling that associated with *Couthouyia*.

Shell thin, of rather papery texture, spire short, aperture large oval, complete.

Colour, pale dirty white. Sculpture, strong curved growth lines only, which are pronounced on the last whorl, but on the earlier whorls there appears to be an underlying fine concentric striation. Apex minute, tip shining, whorls four, rounded, sutures deep. The body whorl forms the bulk of the shell. Mouth oval, anteriorly a little pointed, outer edge thin, well curved, columella curved, a little reflected, crossing over as a glaze to join the outer lip. A deep narrow umbilical fissure is present.

Length, 6 mm.; breadth, 4 mm.

Habitat.—New South Wales. Type from 65 fathoms of Jervis Bay.

[105] Brazier.—Proc. Linn. Soc. N.S.W., i, 1877, p. 313.
[106] Hedley.—Rec. Austr. Mus., iv, 1901, p. 126, pl. xvii, figs. 22 and 23.

Genus **Tropidorbis**, nov.

(Plate xxiv, fig. 1.)

Type.—*T. mendicus* sp. nov.

The genus *Naricava* was introduced by Hedley[107] for *Adeorbis angasi* A. Adams and Angas, and he included in his genus *A. vincentiana* Angas 1880, *A. angulata* Hedley 1905, and *A. kimberi* Verco 1907. He referred to *Laciniorbis* as being perhaps related, but observed that the peculiar apex of *Naricava* was missing from that group. That characteristic apex was also absent in *A. kimberi*, so that a new generic name must be introduced for the group. The type, named above, seems to be the eastern representative of *A. kimberi*, but is larger and more compact. Shell small, hemispherical, thin, strongly keeled, umbilicate, base flattened. The apex is large, planate, tip inturned, marked off by a varix, smooth. Breadth 5·5 mm.

Pilsbry[108] described *Adeorbis sigaretinus* from Rockhampton, Queensland, and this species is small, thin, discoidal, widely umbilicate, periphery rounded, and is of four to five whorls, the apical whorls very small and glossy and the rest of the shell sculptured with fine concentric lines; this is here made the type of a new genus, *Sigaretornus*.

Thiele[109] has included a family *Adeorbidæ*, comprising a somewhat heterogeneous conglomeration of apparently unrelated species. The group-association and nomination are very unsatisfactory, as much systematic work appears to have been overlooked and incongruous attachments made.

Firstly, many years ago, *Tornus*[110] was proved to be the correct name of the group called *Adeorbis*, and has been used by most systematic workers since.

Secondly, *Naricava* Hedley is made an absolute synonym of *Cochliolepis*, an East American group, of which is written " Das Tier ist ähnlich wie bei *Adeorbis*," which does not apply to the Australian mollusc, whose shell features, especially those of the apex, differ. Then, as a sub-genus, *Laciniorbis* is added, but this has no close relationship conchologically with *Naricava*, and the animal is also unknown.

The inclusion of *Mecoliotia*, *Pickworthia* and *Reynellona*, on conchological grounds alone, is indefensible, and Thiele has entirely missed Bavay's[111] indication that *Pickworthia* should be superseded by *Sansonia* Jousseaume[112], a genus not recorded at all in the Handbuch.

Family **SCALIDAE.**

This family contains very beautiful shells, the famed " *Scala pretiosa* " being one of the most valued of shells of older conchologists, and still a fine acquisition to any collection. It would be surmised that on account of their beauty the species would be well known, and it is surprising to find that the Australian species have been little worked at. The southern Australian forms have been catalogued by May, Pritchard, Gatliff, Gabriel, Verco, Cotton and Godfrey, but the lists of New South Wales and Queensland drawn up by Hedley were compilations only, and do not show the number of existing species. This is mainly due to the fact that Boury made a lifelong study of the group, and his projected work was never completed. Many sections were proposed by Boury, and such, as are applicable, are here made use of. The generic

[107] Hedley.—Proc. Linn. Soc. N.S.W., xxxviii, p. 294, 5 Nov., 1913.
[108] Pilsbry.—Proc. Acad. Nat. Sci. Philad., 1897, p. 363, pl. ix, figs. 4–6.
[109] Thiele.—Handb. syst. Weicht., i, 1929, p. 174.
[110] Iredale.—Proc. Malac. Soc. (Lond.), xi, 1914, p. 171.
[111] Bavay.—Journ. de Conch., lxvi, 1922, p. 155.
[112] Jousseaume.—Ann. Sci. Nat. (Paris), (7), xii, 1892, p. 344.

name *Scala* is preferred to Bolten's *Epitonium*, but the restricted group does not occur in New South Wales, though Queensland specimens closely approximate to *Scala scalaris* (L) of which the type locality is Amboina.

The New South Wales forms only will be here dealt with, as the Queensland ones will be reported upon in another place. Sixty years ago Angas listed five species only as *Scala australis*, *philippinarum*, *jukesiana*, *lineolata* and *scalaris*, a little later adding a new species, *morchi* and then later still, *hyalina* and *clathrus*. Watson, in the Challenger Report, added *aculeata*, apparently confusing two or three species, as he wrote "a very variable species." Whitelegge's list included all the above, three names only being changed, and there were added *granulosa*, *pyramidalis*, *bicarinata* and *delicatula*. Smith described two new species, *ballinensis* and *distincta*, and then Hedley introduced two more from deep water, *bellicosum* and *turrisphari*, and in his Check List allowed three others, *levifoliatum* var, *translucidum*, and *unilaterale*. The last two were errors and must be omitted at present, leaving according to Hedley's List fourteen species of this family in New South Wales waters.

Captain Comtesse, Messrs. E. F. Nash, H. S. Mort and W. L. Dingeldei all became interested in these shells, as they could discriminate so many species in the "Triton" dredgings and at the Dundas dump. Captain K. Moller also sorted out from the trawler's net some beautiful species, and others had been dredged and trawled, so that Hedley's number is now here nearly doubled.

The members of the family can be separated arbitrarily into two series, those having a keel below the periphery seen on the base, and those without. The latter are the true "*Scala*," and the others appear to be a somewhat heterogeneous association, probably with little real relationship. Many are practically smooth between the varices, while others are notably striate or lirate spirally. Generally it will be found that other shell features are available in connection with the above, and that an artificial system can be defined. Another item of interest is the tendency of some species to uncoil, as seen in the typical *Scala*, and curiously enough, the opposite tendency to become very tightly coiled is also strongly marked. The common coincidence of development on similar lines in different countries is well seen in this family, and therefore shell resemblance is of much less value than the factor of geographical distribution. The species appear to have a very restricted range as the tropical species are very easily separable from the temperate forms, even to group valu e.

Genus **Lamelliscala.**

1909. *Lamelliscala* Boury, Journ. de Conch., lvii, p. 258, September 12. Orthotype *Scalaria fasciata* Sowerby.

Shell small to medium, truly scaloid, whorls a little separate but touching, varices simple, few, intervals faintly marked but with no definite striation, not glossy. Lamellæ not rolled back and puckered as in the true species of *Scala*.

Lamelliscala parspeciosa Iredale.

(Plate xxii, fig. 1.)

1929. *Scala parspeciosa* Iredale, Austr. Zool. v, p. 345, plate xxxviii, fig. 14, March 24. Sydney Harbour.

Recently described as *Scala*, this species seems better placed under this genus, the lamellæ being recurved and thin edged, not puckered. The shell is comparatively broader, and the umbilical cavity wider.

Genus **Mazescala**, nov.

(Plate xxii, fig. 2.)

Type.—*Mazescala thrasys* sp. nov.

This genus is introduced for Scaloid shells with whorls tightly coiled and not umbilicated, lamellæ erect and numerous, apical whorls thin and glassy, whorls numerous, subshouldered.

Mazescala thrasys, sp. nov.

(Plate xxii, fig. 2.)

Shell small, thin, elongately awl-shaped, whorls slightly shouldered, rounded, sutures deep, mouth subcircular, coloration white. The apex consists of three and a half glossy subturbinate whorls, pale brownish, with a darker subsutural line. The adult shell is chalky white, ten whorls, the last whorl having twenty erect lamellæ which are peaked above the periphery, suggesting a shoulder, but shell itself rounded. The ribs are not continuous but almost always touching those on the preceding whorl; the interstices are practically smooth. Aperture oval, lips contingent, free, no umbilical chink.

Length, 15·5 mm.; breadth, 5.5 mm. Type from 70 fathoms off Green Cape. Habitat, New South Wales. On the continental shelf.

Mazescala heloris, sp. nov.

(Plate xxii, fig. 3.)

Shell small, broadly elongate, strongly sculptured with erect thin lamellæ, which seem to form a spiny shoulder. Coloration white, apex missing. Whorls seven, well rounded, sutures deep. Last whorl with fifteen stout varices, flattened below the suture, forming a pseudo-shoulder, then broadening into an erect spine, which stands out, and the varix succeeding is broader than preceding. The interstices are crossed by spiral lines, closely packed but showing under a strong lens a minute linear striation, the whole interstitial sculpture being very fine. Aperture roundly oval, quite free, lips contingent, strongly variced, no umbilicus but a strong rib formed in place of the fusion of the ribs basally.

Length, 13·5 mm.; breadth, 7 mm. Type from Sydney Harbour dredgings. Habitat, New South Wales.

Mazescala bellicosa Hedley.

(Plate xxii, fig. 4.)

This species was described by Hedley[113] from 800 fathoms East of Sydney, and other specimens were secured in 250 fathoms in the same neighbourhood. The shell is well described by Hedley, and the type is refigured as above. It is a smaller shell than the preceding, 7·5 x 3.25 mm., but has the same lamellæ, with the shoulder angulation, the interstices being smooth, the ribs between 16 to 20 on the last whorl; Hedley gives seventeen on the type.

[113] Hedley.—Rec. Austr. Mus., vi, 1907, p. 360, pl. lxvii, fig. 18.

Genus **Laeviscala.**

1909. *Laeviscala* Boury, Journ. de Conch., lvii, p. 257, September 12. Orthotype *Scalaria subauriculata* Souverbie.

1909. *Graciliscala* Boury, Journ. de Conch., lvii, p. 257, September 12. Orthotype *Scalaria gracilis* Sowerby.

Although called "Laevi" the interstices of the type are delicately spirally striate.

Laeviscala tacita, sp. nov.

(Plate xxii, fig. 5.)

This species has been commonly known as *Scala aculeata* Sowerby[114], which was described from Hong Kong as "*laevi,*" and in the Thesaurus[115] three species from different localities are figured under this name. In our collection three or more species were also found masquerading under this name, so the common Sydney shell is here described under the name *L. tacita.*

Shell elongate, thin, varices few, umbilicus none, the shell between the lamellæ delicately sculptured. Coloration white, not shining. Whorls eleven, varices eight in number, continuous, rolled back, not lamellar, fusing into a rib basally. Interstices finely striate, longitudinally crossed by rather distant spiral liræ, forming a microscopic reticulation. Mouth oval, lips just meeting to form a complete free aperture, the final varix normal.

Length, 25 mm.; breadth, 9 mm. Type from Sydney Harbour. Habitat, New South Wales.

Acutiscala minora, sp. nov.

(Plate xxii, fig. 6.)

This shell has been called *S. philippinarum* Sowerby[116], a species described from the Philippine Islands, with the whorls separated and the shell coloured. Our species has the whorls closely adjoined and is pure white.

Shell elongate, thin, rather shining, few varices which are rather flattened and some at the suture are broadened and appressed to those of the preceding whorl. Apex missing, ten adult whorls, nine varices on last whorl, not forming a basal rib, the mouth oval, lips continuous, aperture complete. The facies of the shell is straight sided through the contiguous flattening of the varices.

Length, 24 mm.; breadth, 10 mm. Type from Sydney Harbour. Habitat, New South Wales.

The genus *Acutiscala* was introduced by Boury[117] with *S. philippinarum* Sowerby, as type, and is here used. The succeeding species has been called *S. jukesiana* Forbes, but while Forbes gave no locality the novelties were mostly Queensland shells, and his description and figure are not well applicable to the Sydney shell.

[114] Sowerby.—Proc. Zool. Soc. (Lond.), 1844, p. 12.
[115] Sowerby.—Thes. Conch., i, 1844, p. 86 bis., pl. 32, figs. 35–37.
[116] Sowerby.—Thes. Conch., i. 1844, p. 86 bis., pl. 32, figs. 1–3.
[117] Boury.—Journ de Conch., lvii, 1909, p. 257, 12 Sept.

Acutiscala ampacta, sp. nov.

(Plate xxii, fig. 7.)

Shell small, elongate, narrow, many whorled, whorls rounded, sutures deep, closely lamellate, colour white. Apical whorls three, elongately turbinate, smooth, glossy, pale brown, adult whorls nine, adorned with about fifteen upright lamellæ, scarcely recurved, not continuous, and not forming a basal rib; the interstices are smooth and shining. Mouth oval, lips scarcely continuous, attached to body whorl, outer lip not strongly variced, no umbilicus.

Length, 13·5 mm.; breadth, 4·5 mm.

Habitat.—New South Wales. Type from Sydney Harbour dredgings.

Acutiscala fabia, sp. nov.

(Plate xxii, fig. 8.)

Shell small, awl shaped, many whorled, whorls rather flattened, sutures rather shallow, lamellæ close and continuous, colour white. Apical whorls missing, eight adult whorls remain, last whorl with twenty lamellæ continuous from whorl to whorl, interstices dull, faintly striate concentrically. Mouth oval, inner lip crossing as a glaze only to meet the outer lip. No umbilicus and no umbilical rib.

Length, 9 mm.; breadth, 4 mm.

Habitat.—New South Wales. Type from Sydney Harbour dredgings.

Acutiscala coreta, sp. nov.

(Plate xxii, fig. 9.)

Shell small, elongate, many whorled, whorls rounded, sutures deep, lamellæ few and rather distant, mouth free, no umbilical rib nor umbilicus. Colour white, apical whorls four, elate, turbinate, shining white. Adult whorls eight, adorned with distant upright lamellæ inclined to form a sub-shoulder through peaking above the periphery. Nine lamellæ on last whorl, last forming a strong varix, lips of mouth continuous, a little reflected sub-basally but not producing a basal rib; the interstices between the lamellæ are very faintly striate.

Length, 11 mm.; breadth, 4·5 mm.

Habitat.—New South Wales. Type from 70 fathoms off Green Cape.

Acutiscala christyi, sp. nov.

(Plate xxii, fig. 10.)

Shell of medium size, rather broadly elongate, whorls rounded, not separate, lamellæ few and distant, mouth free. Coloration dull white, with brown band. Apex missing, nine adult whorls remain; the lamellæ on the last whorl numbering twelve, continuous, somewhat erect, then recurved and developing a little peak at the shoulder, but not sufficiently to make it a pseudo-shoulder. In between the lamellæ a fine sculpture of concentric liræ is developed, the intervals between which are finely regularly longitudinally striate. There is no basal rib, the mouth being free from the body whorl, oval, and notably varicose.

Length, 17 mm.; breadth, 8 mm.

Habitat.—New South Wales. Type from Sydney Harbour dredgings.

Although this species is placed under *Acutiscala* it differs in the freedom of the whorling and the strong striation of the whorls, and therefore a new subgenus *Pudentiscala* is added for it alone.

Limiscala helicornua, sp. nov.

(Plate xxii, fig. 11.)

Shell small, elongately broadly oval, thin, varices numerous, whorls very rounded, mouth free, umbilicus present. Coloration pale horn, braided with brown. Apex missing, eight adult whorls sculptured with short ribs, which are flattened on the last whorl, interstices smooth and shining; the ribs are not continuous, and there is no basal chord present. The mouth is oval and free.

Length, 19 mm.; breadth, 9 mm. Type from Sydney Harbour dredgings.

This has been called *tenellum* Hutton, but that Neozelanic shell is smaller, and with fewer ribs and also narrower.

This is placed under the genus *Limiscala* founded by Boury[118] on the *Scalaria lyra* of Sowerby, which recalls the present species in general appearance, and the Queensland relative has been listed under Sowerby's name.

Genus **Obstopalia**, nov.

(Plate xxii, fig. 12.)

Type.—*Obstopalia lixa* sp. nov.

Shell elongate, small, awl-shaped, thin, varicose, longitudinals obsolescent, spiral grooves notable, mouth not complete, glassy white. Apex mamillate.

This shell was at first mistaken for *translucidum*, but does not now appear to belong to this family but rather to be related distantly to *Diffalaba*. The apex is of about one and a half whorls and glassy, the succeeding whorls rather flattened, but sutures impressed. Obscure longitudinal ribs forming varices, which are re-absorbed, disappear with growth, and spiral grooves develop as the shell increases; six or seven grooves on the penultimate whorl and continuing on the rounded base of the last whorl. The mouth is not complete, the outer lip thin, the columella a little twisted, quite imperforate.

Length, 12·5 mm.; breadth, 5 mm. Type from 70 fathoms off Green Cape.

Habitat.—New South Wales. On the Continental Shelf.

Genus **Solvaclathrus**, nov.

(Plate xxii, fig. 14.)

Type.—*Solvaclathrus jacobiscala* sp. nov.

Shell small, glassy, uncoiled, distantly ribbed, ribs lamellate, interstices smooth and shining, mouth subcircular, varicose. Apical whorls three, glassy, adult whorls seven, showing seven or eight distant lamellæ, the mouth presenting the last of these as a surrounding varix.

Length, 14 mm.; breadth, 8 mm.

Habitat.—New South Wales. Type from Sydney Harbour dredgings.

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[118] Boury.—Journ de Conch., lvii, 1909, p. 258, 12 Sept.

Queensland shells are more elevated, more disjointed, and with fewer ribs, while New Caledonian specimens (probably *paucilobata* Boury) are larger, still more disjointed, and have only six ribs to the whorl. Sowerby's *hyalina*, under which this species has been placed, came from the Philippine Islands, and is much larger, with six *crenulate* varices, while *laxata* has simple but more numerous varices.

Folaceiscala carchedon, sp. nov.

(Plate xxii, fig. 13.)

Shell very small, thin, elongate, varicose as well as lamellate, interstices strongly concentrically lirate, non-umbilicate, mouth nearly free.

Colour.—Cream. Apical whorls missing, nine adult whorls showing erect lamellæ with a small peak below the suture, too high to form a shoulder, suggesting more a canaliculate suture, one or two varices present on each whorl. Twenty lamellæ, ncluding three varices, may be counted on the last whorl, all discontinuous; the varices are irregular, from half to three quarters of a whorl apart. A dozen spiral liræ may be seen on the penultimate whorl. The mouth is oval, complete, varicose.

Length, 8·5 mm.: breadth, 3 mm. Type from Sydney Harbour dredgings.

Habitat.—New South Wales.

The genus *Folaceiscala* was introduced by Boury[119], with *S. dubia* Sowerby as type, and is here used for the species with the interstices spirally lirate, the whorls being well rounded.

Folaceiscala barissa, sp. nov.

(Plate xxii, fig. 15.)

Shell of medium size, elegantly awl-shaped, thin, closely finely lamellate; whorls, many, rounded, perforate, mouth barely complete and free. Colour, dirty white. Apex of three elongate glassy whorls, ten adult whorls, the sculpture of fine longitudinal lamellæ, the interstices crossed by numerous flat liræ. The last whorl shows thirty-five to forty lamellæ, which are of different strength, some fine, others large and recurved, while still others approach varices in size: about thirty concentric liræ appear on the last whorl and between these may be seen five longitudinal threads. The mouth is oval, and the inner lip reflected a little before it joins the outer to form a complete aperture. The umbilicus is narrow but distinct.

Length, 18 mm.: breadth, 8 mm. Type from Sydney Harbour dredgings.

Habitat.—New South Wales.

The lamellæ in this shell are delicate and often get broken, but there appears to be another species with the lamellæ even more fragile and tending to obsolescence.

Folaceiscala antisoa, sp. nov.

(Plate xxii, fig. 16.)

Shell elongate, awl-shaped, thin, lamellæ short and distant, spiral liræ large and notable, mouth free, umbilicus present. Apical whorls missing, adult whorls nine, white and glassy, the lamellæ rather insignificant and far apart, sixteen on the

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[119] Boury.—Journ de Conch., lx, 1912, p. 93, 15 Dec.

last whorl; below the suture is a smooth patch, then eleven flat liræ cross the penultimate whorl without any longitudinal striations; on the last whorl these concentric liræ also stop on the base, leaving the umbilicus smooth save for the longitudinals.

Mouth oval, regular, free, the outer lip almost variced by the last lamella.

Length, 19 mm.: breadth, 7·5 mm. Type from Sydney Harbour dredgings.

Habitat.—New South Wales.

Contrary to the preceding species, this shell has strong and distant lamellæ, and the concentric liræ are also stronger and more pronounced.

Folaceiscala pindasa, sp. nov.

(Plate xxii, fig. 17.)

Shell small, broadly awl-shaped, strongly lamellate, finely concentrically lirate, mouth complete, umbilicus closed by basal rib. Colour, white. Apex broken, apparently long, smooth and glassy, seven and a half adult whorls. Sculpture of stout lamellæ recurved and crenulated, peaked a little just below the suture, not continuous, but separate, basally running together into a stout rib, which closes the umbilicus. The spiral liræ are difficult to count (about nine on the penultimate whorl) as they have subordinate spiral threads between them. The mouth is roundly oval and complete, the last lamella forming a varix for the outer lip.

Length, 14 mm.: breadth, 7 mm. Type from Sydney Harbour dredgings.

Habitat.—New South Wales.

This species shows so many differences, the closed umbilicus, the crenulated lamellæ, and the dense spiral sculpture, that a new subgenus *Crenuliscala* is here proposed for it.

Genus **Narvaliscala**, nov.

(Plate xxii, fig. 18.)

Type.—*Narvaliscala dorysa* sp. nov.

Shell of medium size, elongate, acuminate, strongly variced, mouth almost circular, pronounced basal rib, imperforate. Sculpture of rounded longitudinal ribs overridden by a few threads with strong varices present. The apex is missing, fifteen whorls remain, each of which is completed by a varix. The last whorl, from varix to varix, shows twenty low rounded ribs overridden by six concentric threads, the base flattened, granulose, showing neither longitudinal ribs nor spiral threads. The varices are very large and round, and overridden by the spiral threads also, the mouth circular and attached to the base.

Length, 27 mm.: breadth, 7 mm. Type from 150–200 fathoms off Gabo Island.

Caloscala was proposed by Tate[120] for a fossil *Scala*, and its relatives may turn up in the deeper waters off the Coast, while Boury[121] introduced *Mammiscala* for a Muddy Creek shell, but the bulbous *striate* apex is a stumbling block at present.

[120] Tate.—Southern Science Record, 1885, p. 3. Orthotype, *Caloscala mariæ*, Tate.
[121] Boury.—Journ. de Conch., lvii, 1909, p. 255, 12 Sept. Orthotype, *S. ralphi* = *pachypleura*, Tate, non Conrad.

Murdochella macrina, sp. nov.

(Plate xxii, fig. 19.)

Shell minute, elongate, longitudinally wrinkle sculptured, apex stout, outer lip thin. Coloration dirty white.

Apex striate, apparently stopped by a varix, longitudinally ribbed, tip incurved: adult whorls with longitudinal wrinkles overriding a couple of concentric ridges, on the last whorl increasing to four, the lowest being a bounding rib encircling the base, which is flattened and a little excavate, smooth, save for growth striæ. There are seven and a half adult whorls, well rounded, sutures fairly deep, but no varices, the outer lip being thin and sharp, basally flattened by the basal cord; the columella is practically straight and almost forms a canal-like projection with the basal cord.

Length, 5 mm.: breadth, 1·25 mm. Type from 80 fathoms, 22 miles east of Narrabeen.

Habitat.—New South Wales. On the Continental Shelf.

The genus *Murdochella*[122] was introduced by Finlay for *Scala laevifoliata* Murdoch and Suter, a Neozelanic deepwater shell, with which the present shell was at the time confused, but subsequently Neozelanic species have been added, and probably some more Australian species occur. A doubtful member of this family.

Genus **Dissopalia**, nov.

(Plate xxii, fig. 20.)

Type.—*Scala turrisphari* Hedley.

Shell minute, elongate, whorls strongly shouldered, sutures very deep, mouth almost free, sculpture of longitudinal ribs, but apex non-Scaloid, being large, pupoid, rather bulbous at the tip and strongly spirally lirate. The apical features will probably determine the rejection of this genus from this family, but the subcircular mouth gives no clue to any other location at present. When Hedley[123] introduced this species he also gave a figure (fig. 19) of *Scala minutula* Tate and May, also with a sculptured apex. Cotton and Godfrey[124] have proposed a genus *Parascala* for this latter species (*minutula*), but Hedley had previously transferred it to the Rissoidæ, under his genus *Attenuata*, based on his *Rissoa integella*, while I[125] had separated it generically even from that, naming it *Cænaculum*, and indicating that it was not referable to the family.

Genus **Plastiscala**, nov.

(Plate xxii, fig. 21.)

Type.—*Scala morchi* Angas.

Shell small, awl-shaped, solid, apex mamillate, sculpture weak longitudinal ribs and strong concentric liræ, varicose, mouth roundly oval, imperforate. Whorls eight and a half, plus one and a half smooth mamillate whorls, the adult sculpture showing about twenty rounded depressed longitudinal ribs overridden by stout cords, about six on the penultimate whorl extending on to the base on the last whorl, where there is an indistinct encircling basal cord.

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[122] Finlay.—Trans. New Zeal. Inst., lvii, 1926-27, p. 402 (separate, 23 December, 1926. Volume, 10 March, 1927).
[123] Hedley.—Rec. Austr. Mus., vi, 1905, p. 52, fig. 18 in text.
[124] Cotton and Godfrey.—South Austr. Nat., xiii, 1931, p. 7.
[125] Iredale.—Proc. Linn. Soc. N.S.W., xlix, 1924, p. 244.

From 54–59 fathoms off Wattamolla, New South Wales, a larger, more slender shell with more rounded whorls was secured; the longitudinals are more sharply cut and the spiral cords are finer and more distinct; the basal cord is more definite and the basal liræ more crowded. This may be called *Plastiscala morchi bentha* subsp. nov. (Plate xxii, fig. 23.)

From 250 fathoms 23 miles east of Sydney, a still more slender form was dredged, and in this case the sculpture is much weaker, the longitudinal ribs notably so, while the concentric cording is also much less defined and the varices more flattened. This form is here named *Plastiscala morçhi profundior* subsp. nov. (Plate xxii, fig. 22.)

Genus **Pomiscala**, nov.

(Plate xxii, fig. 24.)

Type.—*Scala perplicata* Iredale.

Shell of medium size, somewhat obese basally, nonumbilicate, columella reflected, mouth oval, not continuous, a faint basal cord overridden by longitudinal lamellæ, the lamellæ continuous from whorl to whorl, interstices practically smooth.

The type species was described[126], as it had been known as *S. perplexa* Pease, a Hawaiian shell with a superficial facies. The shell, on account of the basal cord, falls into the "*Cirsotrema*" series, but in every other respect seems to belong to the "*Scala*" group. Overlooking that "essential" feature, I described a *Cirsotrema kelea*[127] from Queensland, without a basal cord, and this must now be removed to *Variciscala* Boury[128], which has for type, *Scalaria raricosta* Lamarck[129], a closely related species.

Genus **Dannevigena**, nov.

(Plate xxii, fig. 25.)

Type.—*Dannevigena martyr* sp. nov.

Shell fairly large, subulate, sutures well impressed, non-umbilicate, strongly basally ridged, sculpture of wrinkled lamellose ribs, interstices striate.

The single specimen measures 38 mm. in length, and 15 mm. in breadth, and was taken by the "Endeavour" in 115–145 fathoms 55 miles south of Gabo Island, Bass Strait.

The apical whorls are missing, and 9½ adult whorls remain, the last whorl showing sixteen rather closely set ribs, each rib formed of fine lamellæ packed against each other and then recurved so that the rib is longitudinally closely frilled and the ribs appear broader than the interstices; at the base of the ribs the interstices are much broader than the ribs. The interstices are faintly concentrically striate. The base is flattened and the ribs flatten towards the aperture, forming a basal pseudo-rib in place of the umbilicus; the inner lip extends across to the outer, and completes the aperture, the outer lip being lamellately varicose by the presence of the last longitudinal rib. The mouth is roundly oval, almost subcircular.

[126] Iredale.—Austr. Zool., v, 1929, p. 344.
[127] Iredale.—Mem. Queenld. Mus., x, 1930, p. 87, pl. ix, fig. 16, 28 August: Michaelmas Cay, Q.
[128] Boury.—Journ. de Conch., lvii, 1902, p. 258, 12 September.
[129] Lamarck.—Hist. Anim. s. Vert., vi, (2), 1822, p. 228.

Genus **Opalia.**

1853. *Opalia* H. and A. Adams, Gen. Rec. Moll., i, p. 222, November. **New name for** *Clathrus* Gray, *non* Oken. Orthotype *Scalaria australis* Lamarck.

[1876. *Psychrosoma* Tapparone-Canefri, Journ. de Conch., xxiv, 154 (April 1). New name for *Opalia* Carpenter 1865, not H. and A. Adams 1858, has for haplotype, *Opalia bullata* Carpenter, and is not a synonym.]

Medium carinate Scaloid shells, turreted, rather straight whorls, imperforate, boldly distantly ribbed, ribs not continuous, mouth small, oval, base flattened, ten ribs to a whorl, interstices microscopically scratched.

Opalia australis Lamarck.

(Plate xxii, fig. 26.)

Described from the seas of New Holland, sent by Macleay; Port Jackson, New South Wales, may be selected as the restricted type locality.

Genus **Nodiscala.**

1889. *Nodiscala* Boury, Bull. Soc. Mal. Ital., xiv, p. 161. Orthotype, *Scalaria bicarinata* Sowerby.

Although Boury, at the place cited, was dealing with Italian fossils, he named as type of his new genus *Nodiscala*, the recent shell *Scalaria bicarinata* Sowerby. This shell is small, very solid, few whorled, the suture crenulated, the mouth very much thickened and the sculpture cancellate.

Nodiscala apostolorum, sp. nov.

(Plate xxii, fig. 27.)

Although Hedley ruled out the record of *Scala bicarinata*, the species thus named appears to be very close to the Philippine shell in generic features. Shell small, stout, whorls rather flattened, sutures not crenulate in this shell, the pseudo-crenulation being the junction of the longitudinal ribs with the preceding whorl, strong basal keel, mouth oval, surrounded by a large flattened varix, imperforate. The apex is stout and incurved, apparently smooth, half a whorl only, the succeeding whorls six in number, longitudinally ribbed, ribs rounded, flattened at the suture, and resting on the base of the rib of the preceding whorl, ribs numbering twelve, overridden by a fine threading throughout; on the last whorl above the basal keel another weaker rib encircles the shell above the periphery, making the last whorl imperfectly bicarinate. The mouth is oval, not separated from the body whorl, and with a broad flattened varix, showing the strong threading of the whorls.

Length, 7 mm.; breadth, 2 mm. Dredged off Ball's Head, Sydney Harbour.

Habitat.—New South Wales.

Genus **Rectacirsa**, nov.

(Plate xxii, fig. 28.)

Type.—*R. fregata* sp. nov.

Shell small, solid, few whorled, strong basal keel and stoutly varicose aperture. The apex consists of three and a half smooth whorls, elongate, stopped by a varix, and a little tilted; the succeeding whorls are six in number, sculptured with longitudinal ribs, the intervals finely concentrically striate; the ribs are separated, elevated, eleven on the last whorl but not continuing on the base. There are about ten concentric striæ on the last, again none on the base. The whorls are well rounded, the sutures deep, the ribs distant and sharply cut. The mouth is roundly oval, protected by a strong flattened varix and there is no umbilical chink.

Length, 4 mm.; breadth, 1·5 mm. Type from 250 fathoms off Sydney.

Habitat.—New South Wales. On the Continental Shelf in deeper water.

This was regarded by Hedley as *S. distincta* Smith, but see succeeding note. Hedley also included *S. translucida* Gatliff[130], from off Narrabeen, in 80 fathoms, but the shell is too imperfect to describe, though it is certainly not Gatliff's species, which has been made the type of a new genus *Propescala* by Cotton and Godfrey[131].

The inclusion in Hedley's Checklist of Marten's *unilaterale* was due to an error made by Boury in the reference cited by Hedley. In that place Boury inadvertently wrote " Sidney, 410 fath.," " Challenger," " Coll Tomlin," but on the next page he states that Tomlin's specimen came from Singapore.

Scalaria distincta Smith.

(Plate xxii, fig. 29.)

This species was described by Smith[132] from some dredgings supposed to have been secured by the " Challenger " at Station 164B, somewhere off Sydney in 410 fathoms. At first Hedley suggested the total rejection of this " haul," as it proved to show a large number of deepwater Atlantic shells. Then some of the new species were recovered in shallower water about the same place and rehabilitated. This one was thus allowed to enter the authentic New South Wales list, but the specimens so determined do not agree at all well. Consequently, a copy of the original figure is here given for reference at a later date.

Genus **Granuliscala.**

1909. *Granuliscala* Boury, Journ. de Conch., lvii, p. 256, Sept. 12. Orthotype, *Scalaria granulosa* = *S. granosa* Quoy and Gaimard.

Shell medium, elongately conical, whorls a little flattened, longitudinal sculpture marked on early whorls, becoming obsolete on later, interstices minutely striate and roughened so as to appear granulose; whorls many, ribs eight to a whorl, mouth broadly oval, not complete nor varicose, inner lip reflected, forming a pseudo-canaliculate basal tip with the outer lip.

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130 Gatliff.—Proc. Roy. Soc. Vict. (N.S.), xix, 1906, p. 2, pl. 1, figs. 3, 4.
131 Cotton and Godfrey.—South Austr. Nat., xiii, 1931, p. 7, 31 December.
132 Smith.—Proc. Zool. Soc. (Lond.), 1891, p. 441, pl. 35, fig. 15.

Granuliscala ballinensis Smith.

(Plate xxii, fig. 30.)

Smith[133] described this species from Ballina, northern New South Wales, and it is easily separated from the West Australian *granosa* Quoy and Gaimard.

The New South Wales members of the family Scalidæ will now read: *Lamelliscala parspeciosa* Iredale, *Mazescala thrasys* Iredale, *Mazescala heloris* Iredale, *Mazescala bellicosa* Hedley, *Laeviscala tacita* Iredale, *Acutiscala minoa* Iredale, *Acutiscala ampacta* Iredale, *Acutiscala fabia* Iredale, *Acutiscala coreta* Iredale, *Acutiscala (Pudentiscala) christyi* Iredale, *Limiscala helicornua* Iredale, *Obstopalia lixa* Iredale, *Solvaclathrus jacobiscala* Iredale, *Folaceiscala carchedon* Iredale, *Folaceiscala barissa* Iredale, *Folaceiscala antisoa* Iredale, *Folaceiscala (Crenuliscala) pindasa* Iredale, *Narvaliscala dorysa* Iredale, *Murdochella macrina* Iredale, *Dissopalia turrisphari* Hedley, *Plastiscala morchi* Angas, *P. m. bentha* Iredale, *P. m. profundior* Iredale, *Pomiscala perplicata* Iredale, *Dannevigena martyr* Iredale, *Opalia australis* Lamarck, *Nodiscala apostolorum* Iredale, *Rectacirsa fregata* Iredale, *Scalaria distincta* Smith, *Granuliscala ballinensis* Smith. All are here figured on Plate xxii.

Family **CYMATIIDÆ.**

When I introduced the genus *Cymatona*, I[134] did not make any remark about the large nucleus, which was one of the outstanding features of the shell. Since then specimens have turned up showing this nucleus in a new light, and a figure is here given. It is somewhat globosely turbinate and has a notable hairy periostracum arranged in lines.

Many years ago Kesteven[135] studied the apices of the Australian members of this family, and I have been accumulating all the material possible dealing with this matter. Recently Finlay[136] devoted some time to this subject in connection with the Neozelanic species, and more recently Powell[137] has also contributed some ideas, but the family characters seem even more complex than these have concluded. Powell apparently accepts Finlay's diagnoses of the apical characters, but the first specimen picked up, *Charonia rubicunda* Perry, showed an apex disagreeing with Finlay's data " polished, white and shining, with no trace of horny envelope " as it was dull, pale red, and covered with a thin periostracum. However, upon investigating a series of *Austrosassia*, upon which Finlay based his work, I find that the " shining white apex " is covered at first with a thick hairy periostracum as in the apex of *Cymatona* here figured This nullifies the whole of Finlay's separation, and, while the series he has indicated may be differentiated, general features of the apex cannot be utilized as absolute characters.

In 1929, I[138] listed the New South Wales members of the family, and placed under the genus *Cymatium* the following species, with the proviso that I would rearrange them later: *caudatum, exaratum, gemmatum, labiosum, australasia, sinense, waterhousei frigidulum*; *spengleri*, (*spengleri*) *procerum, boltenianum, pyrum, zimara* and *nicobaricum.* Using Dall's classification, we can place *pyrum* and *sinense* under *Ranularia*, *caudatum* under *Tritonocauda*, *nicobarica* under *Lampusia*, *australasia* under *Monoplex*, but the remaining ones do not fall under any of the named groups. The *spengleri* series has been located under *Cabestana* by Finlay and Powell, but they

133 Smith.—Ann. Mag. Nat. Hist. (6), vii, 1891, p. 139.
134 Iredale.—Rec. Austr. Mus., xvii, p. 177, 4 September, 1929.
135 Kesteven.—Proc. Linn. Soc. N.S.W., xxvii, 1902, pp. 443–483, pl. xvii.
136 Finlay.—Trans. New Zeal. Inst., lxii, 1931, p. 10.
137 Powell.—Trans. New Zeal. Inst., lxiii, 1932, pp. 154–164, 28 February, 1933.
138 Iredale.—Rec. Austr. Mus., xvii, 1929, p. 178.

are certainly not congeneric with the tropical type, *cutaceus* Linné, and the new genus *Cymatilesta* is here introduced, the type species being *spengleri* Perry. Many juveniles are before me, and the shell begins as a four-whorled turbinate horny envelope, adorned with rows of hairs as figured for *Cymatona*, but not so pronounced. A short canal with a thickened outer lip is present, and inside this horny envelope a shelly replica is formed, and as the shell itself follows, the horny outside wears off, leaving a shining, polished, white apex. The species *waterhousei* appears to have a similar protoconch; it has been found among the Harbour dredgings, and the form is still narrow like the deepwater *frigidulum*. Powell has named a New Zealand shell *C. waterhousei segregata*, classing with it the Kermadec shell, and also the Tasmanian one, a very unwise association. My series of Kermadec shells does not look at all like Powell's figure, being narrower and more like the New South Wales shells. Tasmanian shells are more like the typical *waterhousei*, the small specimen figured by Powell from South Australia being rather atypical.

The species *exaratum* is rather difficult to place, as it shows the long horn-covered apex, and is conchologically not unlike *cutaceus*, the type of *Cabestana*, but it is somewhat variable, and the forms lead away from that group, so that it will be better to differentiate it as *Cabestanimorpha* until the animals are closely studied.

Powell has figured a strange looking Neozelanic shell as *labiosum* Wood, separating it from *strangei*, the New South Wales form. Upon reinvestigating this matter I find that I was misled in accepting the British Museum locality of West Indies for *labiosum*, as Wood[139] figured it from Mrs. Mawe's Cabinet from an unknown locality, and the figure is very like the Sydney shell. However, that matter cannot be definitely settled here, so we may continue the undoubtedly correct name *strangei* for the local shell, but my Kermadec series is definitely not separable, with the few Sydney shells available. The small size, few varices, short, rather recurved canal, indicate the distinction of this little shell, but the apex is rather like that of *Bursa*, horny and variced and generally notably tilted. Thus it must be separated as *Particymatium*, gen. nov., the type being *strangei* Angas. Angas[140] recorded *Tritonium gemmatum* Reeve from Cape Banks, Botany Bay, and this species has not since been found in this locality although a similar shell is not uncommon in Queensland. Recently Mr. Ralph Blacket found a strange shell at Nielsen Park, near Watson's Bay, Port Jackson, and this is here figured, as it resembles *gemmatum* sufficiently to have been mistaken for it. As it is undoubtedly distinct it is here called *Septa* ? *blacketi* sp. nov. (Plate xxiii, fig. 3). The shell is rather small, but larger and broader than *S. rubecula*, with the ribs *not* nodulose. It is dead and faded, but is now creamy, and shows darker brown bands varied by white on the varix, as in *rubecula*. The mouth is a little more open, but otherwise the general facies links this species up with the tropical shell. The apical whorls are missing, but otherwise the shell is in good condition. Four adult whorls remain, with three varices on the last two whorls, the the first two showing none. On the last whorl about eleven spiral cords encircle the whorl, the cords being flattened, and separated by wide interspaces, which are finely longitudinally striate; the preceding whorls show three cords. The varix is solid and broad, and is regularly strongly denticulate on its inner border. The inner lip is strongly wrinkled, exactly as in *S. rubecula*, and the canal is short and open.

Height, 40 mm.; breadth, 25 mm.

Habitat.—New South Wales.

This will allow the elimination of *gemmatum* Reeve from our list.

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[139] Wood.—Suppl. Index Test., 1828, (preface, 17 May), p. 15, pl. 5, fig. 18.
[140] Angas.—Proc. Zool. Soc. (Lond.), 1877, p. 179.

In rearranging the species it will be better to call the small specimens of *waterhousei*, *C. waterhousei tepida* subsp. nov. as comparatively they are broader than the deepwater shell and have the spiral liræ more distant, and notably more nodulous on the periphery, about five strong nodules being counted between each varix. The type measures 43 mm. in height by 23 in breadth, and was picked out of the "Triton" dredgings by Mr. E. F. Nash.

Although the list of Cymatiid shells is becoming so large there appears to be still more, as among the *exaratum* series a thinner shell with a finer ornament, rounder whorls, and a somewhat different facies occurs, but its status is not yet determined.

A sufficient series of *sinensis* has now been accumulated to enable the separation of the "Triton" specimens as *R. sinensis defrenata* subsp. nov. (Plate xxiii, fig. 2) Our form is obviously broader, with a shorter spire and a shorter canal, the mouth being more open and the inner lip less strongly wrinkled.

Height, 63 mm.; breadth, 35 mm.

Habitat.—New South Wales. Type from Sydney Harbour.

In the case of *caudatum*, our local specimens differ in the same manner, being smaller, with more depressed spire, shorter canal and mouth more, open and are here named *Tritonocauda caudata vulticula* subsp. nov. (Plate xxiii, fig. 1).

Height, 50 mm.; breadth, 28 mm.

Habitat.—New South Wales. Type from Sydney Harbour.

I[141] noted that *Charonia pumilio* Hedley had not turned up again, and that it might be the juvenile of a large form. Two more, collected many years ago by Brazier at the Black Rocks, Richmond River, are now before me, and agreeing exactly with the type, the species may be accepted as adult, but it cannot be classed under *Charonia*, the apex being of two (smooth) whorls, dome-shaped, and succeeded by longitudinal ribs, crossed by spiral liræ, entirely lacking the cancellation of the *rubicunda* juvenile. For the present it may be placed alongside *Charonia* under the new generic name, *Vernotriton*.

Negyrina subdistorta Lamarck.

I[142] recently added this species to the New South Wales List by means of a specimen trawled off Montague Island, in 55–60 fathoms, and was therefore surprised to see it brought in by Mr. H. S. Mort from the Rose Bay spoil, deposited from the "Triton" dredgings. It was, however, astonishing to find it had been recorded from Port Jackson many years ago, and had been included in Whitelegge's List, but later written off as an unreliable record. Simultaneously with my proposal of *Negyrina*, Thiele[143] had introduced *Charoniella* for the same species, but later acknowledged that my name had a slight priority.

The species described by Hedley and May as *Septa petulans* was later transferred by May to *Eugyrina*, using that name for *subdistorta* Lamarck. Examination of the type suggests that the relationship may be with *subdistorta*, so that *petulans* may be included in the genus *Negyrina*; the apex is decollate and missing at a very early stage.

[141] Iredale.—Rec. Austr. Mus., xvii, 1929, p. 178.
[142] Iredale.—Rec. Austr. Mus., xvii, 1929, p. 177.
[143] Thiele.—Handb. syst. Weicht., i, 1929, p. 283; ii, 1931, p. 739.

Genus **Phanozesta,** nov.

(Plate xxiii, fig. 4.)

Type.—*P. remensa* sp. nov.

A genus of the Cymatiidae, recalling *Cymatona* at first sight, but this is a stouter shell with the outer lip lirate within; the apex is notably smaller, and is turbinate, of three and a half whorls, tip planate, not variced, outer edge straight, covered with a fine glossy horny periostracum with raised longitudinal lines, becoming more crowded towards the aperture and crossed by a couple of concentric similar raised lines (Plate xxiv, fig. 5). This appears to be an essential difference in apical features, as Dall records the *Cymatona* style from very different shells. Adult whorls five and a half, consisting of many concentric ridges and threads overridden by a few longitudinal ribs, causing sharp nodulation and multitudinous fine longitudinal threads, making a very fine reticulation. About twelve concentric ridges, with half a dozen threads between each ornament on the last whorl, the longitudinal nodules being about eight. The canal is a little lengthened, and recurved slightly, and the outer lip is fortified by a strong varix, similar varices preceding this about every three-quarters of a whorl, the outer lip with six or seven strong denticles within.

Length, 28 mm.; breadth, 14 mm. Type from 110 fathoms east of Sydney.

Habitat.—New South Wales, on the deeper edge of the Continental Shelf

Genus **Apollon.**

As still another species was picked out of the " Triton " dredgings the opportunity is taken of fixing the name of the species hitherto regarded as *pusilla*. The generic name was shown to be *Apollon*[144], a subgeneric name, if necessary, being *Gyrinella*. It is now possible that the latter will come into use, as two closely allied species are living in Queensland, hitherto classed as *pusilla*. Mr. Melbourne Ward sent me down some shells picked out of a dredging made in 8 fathoms off Lindeman Island, and there were obviously two species. Upon re-examination of the material already in the Museum, the two were easily differentiated. My colleague, Mr. G. P. Whitley brought back some shells from Rarotonga, and among them was " *pusilla*," certainly distinct from the Australian shells and like the typical " *pusilla* " from Lord Hood's Island.

Tryon[145] lumped under the name *pusilla* the species *concinna* Dunker, *rosea* Reeve, and *polychloros* Tapp-Canefri. Probably many species will now be allowed, as these named seem easily distinguishable. The shell most like " *pusilla* " is here named *facetus*, and the one confused is named *deliberatus*. The larger *gyrinus* is very like *facetus*, but has larger nodulation and strikingly different coloration.

Apollon facetus, sp. nov.

(Plate xxiv, fig. 3.)

Shell small, broad, laterally a little compressed and apparently twisted, the varices continuous along each side running slightly backwards. The dead Sydney shell has the earlier whorls brownish, the later ones bleached white. The apical whorls are about two and a half, smooth, turbinate, but not variced, the succeeding whorls, five and a half in number, are sculptured by means of strong concentric cords which become nodulous through the intersection of longitudinal rounded ribs. As

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[144] Iredale.—Rec. Austr. Mus., xviii, p. 213, 29 June, 1931.
[145] Tryon.—Man. Conch., iii, p. 44, 31 December, 1880.

there is a varix each half whorl, the ribs can be easily counted; on the first there are six cutting three cords, and on the last half whorl, ten distinct cords are seen, with spiral threads between, and these are noduled by nine longitudinal ribs, giving a fine reticulate effect. The external varix is well spread out, broad and flattened, showing the ten cords and intermediate threading clearly; the outer lip itself projects a little from the internal edge of the varix, and in the interior are denticulations corresponding to the intervals between the external cords. The inner lip is only slightly shown as a glaze, but on the anterior portion of the columella there are some nodules. The canal is moderately short and narrow.

Height, 19 mm.; breadth, 14 mm. Type from Sydney Harbour.

Habitat.—New South Wales, Queensland.

Apollon deliberatus, sp. nov.

(Plate xxiv, fig. 4.)

Shell similar to the preceding, but it apparently grows to a larger size, and is easily distinguished by the obsolescence of the reticulate sculpture on the last whorl, which is accompanied by a slight distortion of the body whorl, the varix especially showing the vanishing of the cording.

Coloration of living shell apparently uniform brown, the mouth being a beautiful rose. The early whorls seem very like those of the preceding, but the varices appear to be more closely welded to one another, the nodulation less pronounced, and the sutures not so deep. About the fourth whorl the sculpture becomes definitely weaker, and the last one shows an upward swelling crowding the suture and a depressing basally. By this growth the reticulation is eliminated, and only the concentric threads remain on the upper part of the whorl, a weaker cancellation still persists on the lower part, but even this tends to disappear. The varix encroaches on the preceding higher one and also loses its cording, a longitudinal threading taking its place on the upper half. The upstanding outer edge of the lip inside the varix has about eight denticles. The inner lip is well reflected over the columella and extends in a glaze across the body whorl to the outer lip. Canal rather short and very narrow.

Height, 19 mm.; breadth, 14 mm. Larger specimen 25 mm. x 16 mm.

Habitat.—Queensland. Dredged off Lindeman Island, Whitsunday Passage, in about 8 fathoms, associated with the preceding species.

These species, though resembling the " Ranellid " shells, are more closely related to the Cymatiid forms and enter the family Cymatiidae, not the Bursidae.

Annaperenna verrucosa Sowerby.

Captain Comtesse brought in some shells for examination and among them was a small immature shell which, he explained, he had almost thrown away as valueless. It was one of the most interesting (to me) of the very many valuable finds he has made.

At the Kermadecs I collected a very striking shell, which became one of the gems of the collection, as it was recognised as a species named some eighty years previously and not rediscovered in the meanwhile. In my record I[146] used the name *Argobuccinum papilla* Wood, but the supposed synonym *verrucosa* Sowerby is now

[146] Iredale.—Proc. Mal. Soc. (Lond.), ix, p. 73, March, 1910.

known to have been published earlier than Wood's name. The generic location was quite incorrect, but the species does not fall easily either into *Bursa* or *Tutufa*, so the new generic name *Annaperenna* is proposed for *Ranella verrucosa* Sowerby[147].

This is one of the most striking of shells, with a very restricted and curious distribution as far as yet known. Described from unknown locality in 1825, it was not again met with until I secured specimens in 1908 at the Kermadecs. Then Roy Bell, who had collected it at the Kermadecs, found specimens at Lord Howe Isand and at Norfolk Island, and now I record it from the Sydney Harbour dredgings. The logical conclusion is that the original specimen came from Norfolk Island.

While the appearance is very distinct, the details recall those of *Lampasopsis*, but it has a very short anal gutter placed in front of the heavy varix, and thus almost obliterated on the earlier whorls, whereas in *Lampasopsis* the gutter is always prominent. The columella is strongly wrinkled and a very strongly developed inner lip is also wrinkled with colored lines.

Family **NATICIDAE.**

The Naticoid shells included under the genus *Natica* from New South Wales by Hedley read: *N. alapapilionis* Bolten, *N. euzona* Recluz, *N. gualteriana* Recluz, *N. sagittata* Menke and *N. subcostata* Ten-Woods. He rejected *colliei* recorded by Angas, and replaced Angas' *areolata* by *euzona.*

I[148] added *N. shorehami* Prit. and Gatliff and noted that the opercular characters "shelly, smooth, with an obscure marginal sulcus"—would place it in *Cochlis* Bolten, with type *albula* Bolten, the typical *Natica* having a completely sulcate operculum.

So far as can be worked out here, the traditional type of *Natica* has now been altered to *vitellus,* which is said to have a similar smooth operculum, and *Naticarius* Dumeril has been utilized for the series with the operculum strongly sulcate. On account of the similarity of shell sppearance, most workers have become perplexed as to the treatment of this family.

N. alapapilionis Bolten has a very thick irregularly coarsely sulcate operculum, and from shell features may be classed under *Naticarius*, but the little *N. subcostata* Tenison-Woods has a regularly sulcate operculum, and the umbilical features with the small enterng funicle separate it, so it may be regarded as a subgenus, *Quantonatica*.

Powell[149] has distinguished the Neozelanic "*gualteriana*" as *migratoria*, and included thereunder the New South Wales shells so-called, but Finlay[150] has separated the latter as *vafer*, the type being from Shellharbour. Powell[151] has rejected this dissociation, and introduced the new genus *Notocochlis* for his own species.

There are many specimens available from Queensland, and while the operculum shows only one marginal ridge as figured by Powell, its nucleus shows more definite coiling.

The two names on Hedley's List, *euzona* Recluz and *sagittata* Menke, refer to the same thing, and neither are applicable, the former being given to a Philippine Island

[147] Sowerby.—Cat. Shells Tankerville Coll., Jan., 1825, App. p. xviii.
[148] Iredale.—Proc. Linn. Soc. N.S.W., xlix, 1924, p. 254.
[149] Powell.—Trans. New Zeal. Inst., lvii, 1927, p. 560.
[150] Finlay.—Trans. New Zeal. Inst. lxi, 1930, p. 232.
[151] Powell.—Trans. New Zeal. Inst., lxiii, 1933, p. 166, figs. 16, 17, 22.

species, whose types I have examined, and the latter is a West Australian shell, so the local shell is here described as

Notocochlis cothurnata, sp. nov.

(Plate xxiv, fig. 6.)

Shell subglobose, thin, spire a little exsert, shining, aperture semilunar, small umbilical funicle, umbilicus almost hidden, operculum shelly.

Coloration.—Below the suture is a row of brown dots succeeded by wavy lines, which develop strong thickened curved apices with thin shallow intervals, the base surrounded by a series of brown spots, the ground colour being white. The apical whorl is small, smooth, planate, not differentiated from the succeeding four to five adult whorls, which are smooth, with only the finest of growth striæ.

Height, 15 mm.; breadth, 14 mm.

Habitat.—New South Wales. Type from Kurnell, Botany Bay.

This species may be later found to be referable to *Tanea* introduced by Marwick[152] for the Neozelanic *zelandica* Quoy and Gaimard, but its radula must be examined first, especially as the local species has been confused with species from the Philippine Islands, which are scarcely likely to be congeneric with the Neozelanic shells. The operculum of the Sydney species is very thin, shelly, smooth, with two marginal sulcations enclosing a raised rib.

Notocochlis schoutanica diatheca, subsp. nov.

(Plate xxiv, fig. 7.)

From a trawling in 45 fathoms off Crowdy Head, north of Port Stephens, New South Wales, Mr. Dingeldei brought in some small shells picked off the trawl lines by Captain Moller. These were very similar to specimens from the extreme south, though a little Naticoid recalled a northern tropical shell, but upon critical examination it turned out to be a form of *Natica schoutanica* May[153], described from 40 fathoms, off Schouten Island, south Tasmania, a distance of over one thousand miles in a straight line. The operculum is still unknown, but as the generic name *Natica* is unavailable, it is placed under *Notocochlis* until more details are secured. May compared it with the Neozelanic *N. australis* Hutton, for which Powell[154] introduced the genus *Proxiuber.* Our specimens do not agree absolutely with typical *schoutanica* in the formation of the umbilical funicle, and the strong spiral grooving of the umbilicus so are differentiated as above.

Mammilla plumatilis, sp. nov.

(Plate xxiii, fig. 18.)

I[155] described *M. propesimiae* from the Sydney Harbour dredgings, and, much later, looking through a series collected by Mr. E. F. Nash I detected the very beautiful shell now named.

Shell globose, spire very short, aperture very large, thin, finely sculptured.

Coloration.—White, with two interrupted brown bands, columella pale flesh-coloured.

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152 Marwick.—Trans. New Zeal. Geol. Survey, Pal. Bull. 13, 1931, p. 98.
153 May.—Proc. Roy. Soc. Tasm., 1912, p. 45, pl. 2, fig. 3.
154 Powell.—Trans. New Zeal. Inst., lxiii, 1933, p. 167.
155 Iredale.—Austr. Zool., v, 1929, p. 341, pl. xxxviii, fig. 5.

The apical whorls are small and shining, then the succeeding four and a half crossed by fine wavy concentric ridges with radial growth lines reticulating them very delicately. The umbilicus is narrow and deep, an indistinct ridge outlining the umbilical area. The columella is fairly straight and a little reflected, only a faint glaze connecting it with the outer lip.

Height, 35 mm.; breadth, 30 mm. Type from Sydney Harbour.

Habitat.—New South Wales.

An immature shell, apparently of the same species, had been previously collected by Captain Comtesse, who had regarded it as distinct, but it seemed too young to describe.

Marseniopsis innominatus, sp. nov.

(Plate xxiv, fig. 8.)

As No. 705 in Hedley's Check list was included " *Marseniopsis* sp., *Lamellaria indica*, Angas, Proc. Zool. Soc., 1867, p. 199." Although the animal has not yet been recovered, shells are not uncommon, so that it is necessary to give a name to the species for reference, and it is here named *Marseniopsis innominatus* sp. nov.

Shell small, thin, glassy, white, of two whorls, the second very rapidly increasing and descending, the general facies being loosely naticoid. The glossy surface shows no sculpture.

Height, 7 mm.; breadth, 7 mm.

Habitat.—New South Wales. Type from Sydney Harbour dredgings.

Volva volva cumulata Iredale.

(Plate xxiii, fig. 8.)

This shell was named[156], but no figure given, so the above will show the differential characters of the southern form. Comparison with numerous specimens from northern localities show that the local shells are all consistently broader and generally smoother, and striæ, when showing, are weaker and more crowded.

Length, 95 mm.; breadth, 31 mm. Type from Sydney Harbour dredgings.

Habitat.—New South Wales.

Queensland specimens have a breadth of 23–25 mm., and other Pacific Island shells are similarly narrow.

Diminovula manifesta, sp. nov.

(Plate xxiv, fig. 10.)

The type of *Diminovula verepunctata* Iredale[157] was from Caloundra, Queensland, and a living shell brought in from 55–60 fathoms 10 miles east of Sydney showed the same coloration and form. Upon comparison the local shell was found to be smooth, as well as smaller and narrower. Shell narrowly ovate, surface shining, thin, outer lip denticulate all its length; inner lip quite smooth, a nodule at the posterior (apex)

[156] Iredale.—Rec. Austr. Mus., xviii, 1931, p. 222.
[157] Iredale.—Mem. Queensl'd. Mus., x, 1930, p. 85.

end, and a rather prominent columellar tooth in front of the short canal. Coloration glassy white, with three rows of brown blotches, the ends each being marked with brown, the outer lip medially unmarked. There are about thirty crenulations on the outer lip, which is a little variced, and the denticulations cross this pseudovarix.

Length, 9 mm.; breadth, 5.5 mm.

Habitat.—New South Wales. On the Continental Shelf.

Genus **Relegamoria**, nov.

(Plate xxiii, fig. 10.)

Type.—*R. molleri* sp. nov.

Captain Moller brought in a very fine Volute trawled off Manly, New South Wales, in about 85 fathoms.

It is of medium size, 76 mm. long by 33 mm. wide, and the back view presents a beautiful golden brown shining surface, the penultimate and antepenultimate showing a slight white overlying glaze, the apical whorls being four and clear brown in colour. The last two whorls show clearly a pale orange zone followed by a darker brown below the suture. There is a faint lining reminiscent of the marking of *undulata*, but not the same. The whole of the front surface, excepting the apical four whorls, is covered with a thin white glaze, the interior of the mouth also showing the glaze. The four columellar plaits are thickened, and the posterior two show a large double tooth as well. The apical whorls distinguish this species from *Amorena*, and also from *Amoria*, though it seems nearer the latter tropical genus than the former, the local genus of southern Australia.

Genus **Ancillista**, nov.

Type.—*A. velesiana* sp. nov.

A genus of the Ancillidæ of fairly large size, thin texture, open mouth, little enamelling on suture, spire elate, shorter than the aperture, basal canal wide.

Ancillista velesiana, sp. nov.

(Plate xxiii, fig. 9.)

Shell large, thin, elongate oval, spire a little acuminate, shorter than the body-whorl, whorls convex, sutures distinctly marked, last whorl swollen. Whorls six, apex almost planate, outer lip thin.

Coloration.—Initial whorls shining white, the third showing a creamy tinge, darkening into a beautiful golden brown glaze, which vanishes a little in front of the aperture, the last three-quarters of the whorl being non-shining pale yellowish brown. As the glaze practically covers the preceding whorls the real coloration can be seen only on the last whorl; below the suture is a broad white band, and round the base is a deep brown band, succeeded anteriorly by a paler band, the columella itself being white. A delicate striation of growth lines is crossed by an indistinct spiral scratching, seen only on the last whorl, the glaze obliterating it previously. A raised thread runs just above the suture and a slight ridge bounds the basal brown band.

Length, 71 mm.; breadth, 32 mm.; length of spire, 21 mm.

Habitat.—Northern New South Wales. Type dredged off Cape Hawke, in 45–50 fathoms.

This species occurs in Hedley's list as *Ancilla cingulata* Sowerby, a species described from Cape York, North Queensland. The local shell had been separated as long ago as 1864 under the name *A. angasi* by Cox, who, however, never published any description, and the name was sunk as an absolute synonym of the northern form.

The species here described is consistently broader, and the Queensland shell, which measures 72 mm. by 30 mm., with a spire length of 24 mm., has a second broad brown band above the deep brown one seen in the southern species, and this is followed by a sharp ridge, which is missing in the latter case.

Family COLUMBARIIDAE.

This family, proposed by Tomlin, can be accepted, and may be placed near the *Fusinidae*, but there are many more species than have yet been described. The genus *Columbarium* was introduced by Martens[158] for a species collected by the "Gazelle," off Moreton Bay, 76 Faden. Through a curious error it was placed in the genus *Pleurotoma*, being named *P. spinicincta*, and figured on plate 21, fig. 1–3.

A few months later Watson[159] described another species from off Sydney, New South Wales, in 410 fathoms, but he placed it in the genus *Fusus*, calling it *F. pagodoides*, and remarking that Tenison-Woods[160] had used the same name for a fossil, but without description, and that this might even be the same species. Although Watson pointed out the differences between his species and that described by Martens, these have been incorrectly synonymized by some later workers.

Captain K. Moller brought in from 85 fathoms off Manly a broken shell, and as this seemed different he looked out for more, and half a dozen more or less broken specimens have been secured from 70–110 fathoms off Sydney.

Hedley had dredged two good specimens from 250 fathoms 23 miles east of Sydney, and these proved to differ not only from Captain Moller's shells, but also from "Challenger," specimens from the 410 fathom depth. Consequently, four species can easily be distinguished as follows:—

spinicinctum Martens.—Spinose and prickly, quite unlike the southern shells.

pagodoides Watson, 410 fathoms.—Peripheral flange entire, upturned, three ridges below periphery.

hedleyi nov., 250 fathoms.—Peripheral flange strongly toothed, shell thin, two ridges below periphery.

trabeatum nov., 70–110 fathoms.—Peripheral flange weakly toothed, shell stout, three or more post-peripheral ridges.

The latter two are more fully described below, but it may be mentioned that there are many species belonging to this family from the fossil beds of Victoria, Tasmania, and South Australia, but the ones already described do not appear to be comparable with the recent ones above noted, and careful work may reveal some more closely related forms.

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[158] Martens.—Conch. Mitth., ii, p. 105, December, 1881.
[159] Watson.—Journ. Linn. Soc. (Lond.), Zool., xvi, p. 383, 12 June, 1882.
[160] Tenison-Woods.—Proc. Roy. Soc. N.S.W., xi, 1877, p. 72, 1878, ex McCoy M.S. *nom. nud.*

Columbarium hedleyi, sp. nov.

(Plate xxiv, figs. 18, 18a.)

Shell comparatively large for this family, thin, spire moderately elevated, canal very long. Coloration of dead shell, dirty white. The nucleus is about a whorl, very swollen and not differentiated from the succeeding adult whorls. The type has five adult whorls, and is 51 mm. long, but a broken specimen has the canal alone as long. The sculpture begins as a peripheral keel, which almost immediately develops a toothed flange, the teeth being larger and more prominent as the shell increases, the last whorl showing long, flattened, hollow, tube-like processes, recalling the tubes of the Typhinid Murices. The steep shoulder above the periphery is marked only with growth lines, but the base below is adorned with two parallel ridges of very fine prickles, the canal showing similar very obscure prickling becoming obsolete very quickly. The canal is tortuous and narrow. The outer lip is thin, the inner lip reflected as a thick upright glaze.

Length, 51 mm.; breadth, 24 mm. Type from 250 fathoms 23 miles east of Sydney, New South Wales.

Columbarium trabeatum, sp. nov.

(Plate xxiii, fig. 17.)

Differs from the preceding in a few details, but generally the shells are much alike. Coloration, pale to dark brown, uniformly coloured. Peripheral girdle less strongly toothed, but below the periphery at least four strong rows of minute prickles succeeded on the canal by similar series of prickles, which become obsolete towards the end. The type is 60 mm. long and 27 mm. wide. In one specimen with the canal broken, the dark coloration of the shell shows white growth lines, and the peripheral teeth are all whitish; below, the prickly rows are close together, and the shell is stouter, as if it might have come out of shallower water, perhaps the 70 fathom line. Another one with the canal broken right off is very pale and has only three very distinct rows of prickles approaching the deeper water form, and has the inner lip so developed that the mouth has become free.

Habitat.—New South Wales. Deeper water of the Continental Shelf. Type from 110 fathoms east of Sydney, New South Wales.

Colus genticus, sp. nov.

(Plate xxiii, fig. 5.)

When naming *Colus sinovellus* I stated, " It did not agree with the species known as *turrispictus* Martyn, which was included in Hedley's Check List, nor with specimens so determined from northern New South Wales." Mr. W. L. Dingeldei has since brought in from the Dundas dump a specimen of the *turrispictus* group, quite like Martyn's figure, but Martyn's name is inacceptable and our shell is more nodulose. Shell large, white (dead), elongately fusiform, spire long, canal long. Apex missing, but six adult whorls remain, each notably keeled at the periphery. On the last whorl the keel is formed of fourteen angulate nodules, thirteen on the preceding one, twelve on the antepenultimate, and so on. The spiral liræ which dominate the shell vary in strength and number, about eighteen appearing on the shoulder of the last whorl,

of which six are large, the rest smaller. Below the periphery on the body whorl about nine large and many smaller ones occur, the whole being crossed by fine radials, which do not decussate the spirals, but are subordinate to them.

Length, 111 mm.; breadth, 39 mm.

Fractolatirus, gen. nov.

Type.—*F. normalis* sp. nov.

A curious little shell was included in the New South Wales list by Hedley in the family Fasciolariidae under the name *Latirofusus spiceri* Ten.-Woods, of which *L. nigrofuscus* Tate was treated as a synonym.

Tenison-Woods[161] described this species from King Island as *Fusus spenceri*, and Tate[162] had introduced his *Latirofusus nigrofuscus* from Edithburgh, South Australia, making use of a genus proposed by Cossmann[163] for a Parisian Eocene fossil. However, when Cossmann[164] wrote his great work, and figured his type species, he sank his own name *Latirofusus* in favour of *Dolicholatyrus* Bellardi 1883. The figure shows a shell quite unlike ours in form, apertural characters and sculpture, and ours may be diagnosed: Shell elongately fusiform, spire longer than aperture, canal moderately long, columella two plicate, outer lip lirate within, sculpture of longitudinal broad ribs.

Fractolatirus normalis, sp. nov.

(Plate xxiv, fig. 19.)

Shell small, elongate fusiform, spire attenuate, canal long, but apertural length less than that of spire, columella with two plaits, outer lip thick, lirate within. Coloration, uniform brown.

The apex is worn, but seven adult whorls remain; the sculpture consists of longitudinal ribs, which are comparatively few in number, broad and rounded, and these are crossed by fine concentric ridges separated by intervals of two or three times the thickness of the ridges. On the penultimate whorl about fifteen ridges can be counted, and nine longitudinal ribs. On the last whorl the ribs are about the same number, showing, however, strong growth stages between. The aperture is narrow, the outer lip showing about eight long liræ inside, the canal moderately long, straight and narrow. The columella has two somewhat indistinct plaits, and the inner lip is shown as a thick glaze passing to the outer lip, where there appears on the body whorl a slight nodule.

Length, 26 mm.; breadth, 9 mm.; length of aperture, 12 mm.

Habitat.—New South Wales. Type from Sydney Harbour.

Benthindsia, gen. nov.

Type.—*B. problematica* sp. nov.

A deepwater genus recalling *Hindsia* of the tropics, but lacking the lateral compression and much recurved canal.

[161] Tenison-Woods.—Papers Proc. Roy. Soc. Tasm., 1875, p. 137, 21 March, 1876.
[162] Tate.—Proc. Roy. Soc. South Austr., xiv, p. 258, pl. xi, fig. 3, December, 1891.
[163] Cossmann.—Annales Soc. Roy. Malac. Belg., xxiv, p. 175, 1889.
[164] Cossmann.—Essais Paleoconch. comp., livr. iv, p. 22, pl. i, fig. 5, October, 1901.

Benthindsia problematica, sp. nov.

(Plate xxiii, fig. 7.)

Shell broadly fusiform with a long spire, open mouth and short canal, sculpture of longitudinal ribs and spiral cords, mouth variced. Coloration, uniform brown.

Whorls eight, apical one and a half, smooth, small, adult sculpture appearing at once; the last whorl shows nine longitudinal, distant, rounded ribs, the preceding one the same number or one more, and the antepenultimate ten or eleven; the sutures are rather deeply impressed. The longitudinal ribs are overridden by spiral cords of varying strength, the larger ones crossing the ribs making a sub-nodulation. The last rib forms a strong varix, the aperture being smooth internally. The inner lip reflected as a strong glazed pillar.

Length, 28 mm.; breadth, 15 mm. Type from 110 fathoms off Sydney, New South Wales.

Habitat.—New South Wales.

Sydaphera obnixa, sp. nov.

(Plate xxiii, fig. 6.)

Apparently the variation in this group is geographically recognisable at sight, as specimens from northern New South Wales are separable at a glance, being less shouldered and more closely ribbed.

Shell of medium size, spire elevated, about as long as the aperture, mouth fairly open, quite imperforate, shoulder rounded.

Coloration fawnish with red brown bands, a subsutural one most notable. The apex is, as usual, smooth, tumid, a little planate, five adult whorls ornamented by longitudinal ribs crossed by irregular cords, the ribs becoming more distant on the last whorl. About eighteen are there seen, while on the previous whorl at least twenty can be counted, all much more flattened than in the southern shell. The cording is variable in strength, a dozen showing on the penultimate whorl, all finely longitudinally striated. The mouth is lirate within, and the columella three-plaited.

Height, 26 mm.; breadth, 16 mm.

Habitat.—Northern New South Wales. Type from the Richmond River beach.

Genus **Arizelostoma**, nov.

(Plate xxiv, fig. 9.)

Type.—*A. laseroni* sp. nov.

Ten years ago I saw this generic type in the collection of the late Mr. G. MacAndrew, of Shellharbour, New South Wales, but was unable to get the specimen. Mr. C. F. Laseron, who was interested in the Mollusca some years ago, has again taken up the group with his son John, and visiting Shellharbour was fortunate in finding the specimen now described. It belongs to the *Trigonostoma* series, but is rather unlike the tropical type of that genus, and is easily separated by the columella having only two plaits, the true *Trigonostoma* having three. There is a genus *Ventrilia* Jousseaume[165] which, according to Thiele, is similar with only two plaits, but otherwise is American, and quite unlike the present species, hereafter described.

[165] Jousseaume.—Le Naturaliste, ix, 1887, pp. 164–194.

Shell short and broad, spire not much elevated, with very deeply excavate shoulder and wide open umbilicus, columella two-plaited.

Coloration of dead shell, dirty white. Apical whorl, one, tumid, succeeding whorl three. Sculpture of distant rounded longitudinal ribs which crenulate the shoulder; this excavate shoulder shows only growth lines, while the body whorl is encircled by five major cords, and about twenty minor ones. The umbilical cavity penetrates funnelwise to the apex, and is bounded basally by a thickened rib. The columella is almost perpendicular, with two transverse plaits, the aperture practically free and trigonal in shape, and the outer lip thin.

Height, 7 mm.; breadth, 7 mm.

Habitat.—New South Wales. Type from Shellharbour.

Consideration of the species described as *Trigonostoma vinnulum*[166] necessitates its transference from the genus *Trigonostoma* (Tautotype, *T. trigonostoma*), differing in its more compact form, less triangular mouth, which is not free and the minute perforation; these contrast greatly, and demand the new generic term, *Trigonaphera.*

It may also be noted that Jousseaume[167] provided a generic name for the South Australian Cancellarid *spirata* Lamarck, introducing *Nevia* for the species *C. excavata* Sowerby, an absolute synonym of Lamarck's shell.

Benthofascis, gen. nov.

Type.—*Bathytoma biconica* Hedley.

When I[168] reinstated *Teleochilus* in its correct application I promised emendation of its misusage in connection with *Bathytoma sarcinula* Hedley and *B. biconica* Hedley. Recent acquisitions from the trawlers have indicated that these two names refer to the same species, though it is possible that they may serve for geographical races. Hedley first described these species as *Bathytoma,* then he transferred them to *Teleochilus,* and Gatliff and Gabriel relegated them to *Conorbis.* It may be here remarked that *Teleochilus* is altogether missing from Thiele's Handb. syst. Weicht. so that we cannot record his opinion.

Shell biconical, the apertural length a little longer than that of the spire, the apex small, planate, the tip almost incurved and smooth, but spiral ridges begin almost at once, continuing as the adult sculpture. The aperture is long and narrow, the columella a little twisted, the outer lip with a shallow anterior canal, and a rather broad posterior one, the lip thin and sinuous.

Another shell Hedley and Petterd described under *Bathytoma agnata* was left there by Hedley, but it also requires separation. Hedley's specimens came from 250 fathoms off Sydney, and shells from 110 fathoms in the same locality are not very different, but some from 200–250 fathoms off Gabo Island, Bass Straits, are much larger.

Shell more sharply biconical than the previous one, the spire generally longer than the aperture, the apex being of one and a half globose, shining, smooth whorls, the succeeding sculpture is clearly differentiated, the semi-keel of nodules being a notable feature, formed along the line of the posterior channel, which is separated from the body whorl; the anterior canal is short and broad, and the columella is scarcely twisted, the inner lip strongly glazed. The new generic name, *Micantapex,* is given, with *B. agnata* Hedley as type.

[166] Iredale.—Rec. Austr. Mus., xiv, 1925, p. 263, pl. xliii, fig. 18.
[167] Jousseaume.—Le Naturaliste, ix, 1887, p. 222.
[168] Iredale.—Proc. Linn. Soc. N.S.W., xlix, p. 264, 1924.

Hedley and Petterd also introduced *Pleurotoma casearia* from the same 250 fathom dredging, and later Hedley placed it under *Leucosyrinx* Dall, a genus which appears to me quite different. Specimens from 110 fathoms off Sydney are much larger and show wavy lines below the periphery, a feature absent in the typical form. These may rank as a sub-species, while as the apex is shining, elevated, smooth, two whorled, and the nodulous keel of the preceding has developed into a spinose one, and the posterior canal is much longer a genus is also provided, the long posterior canal making the aperture longer than the spire.

The name *Lucerapex casearia regilla* is given to the 110 fathom shell, 21 mm. long.

Family **MITRIDAE.**

The dark-colored Mitre shells from New South Wales are puzzling, five species being allowed in Hedley's list, viz., *carbonaria* Swainson, *cookii* Sowerby, *glabra* Swainson, *rhodia* Reeve and *solida* Reeve. Hedley[169] discussed the species *carbonaria*, *rhodia*, and *cookii*, and I have dealt with *solida*, but the so-called *glabra* has been ignored.

The local shell differs from *carbonaria* in its longer, more attentuate spire, and its proportionately less capacious body whorl. The dead shell here figured is pale fawn, encircled by red lines, but the living shell is covered with a thick brown periostracum through which darker lines show, but, as the animal lives among rocks between, or just below, tide marks, it is always much worn away and the first few whorls missing. The figures will show the differences between the two species, and the so-called *glabra* probably grows to a much greater length, one before me from Twofold Bay measuring 96 mm. long by 24 mm. wide, the figured one from Sydney being 74 mm. by 19 mm. The aperture is of course, comparatively, smaller than that of *carbonaria*, but the columellar plaits are not unlike, being a little stronger and more transverse but of the same number, five or six. The surface is not smooth, as implied by the name *glabra*, but is cut by concentric punctate grooved lines. Swainson's *glabra* had rounded whorls, and the present species has very straight whorls, so that the Sydney shell is here named *Vicimitra exposita* sp. nov. (Plate xxiii, fig. 16.)

Upon reconsidering the matter, the figure of *glabra* seemed to suit better the description of *carbonaria*, and then it was found that the names were published simultaneously for specimens in the Bligh Collection, and consequently almost undoubtedly were synonymous. The name *glabra* was published in December, 1821, and the name *carbonaria* probably in April, 1822, so that the former name would be the valid one. The locality "New South Wales" was given in connection with the latter, and the name was taken from Humphrey's MS., which suggests Tasmania as probably the place whence the species was received. Tasmanian specimens are broader than local ones and have the whorls a little rounded, so that they agree better with the figures and description of *glabra* and *carbonaria*, and until the type or types are recovered I propose to use *Vicimitra glabra* Swainson=*carbonaria* Swainson for the Tasmanian species. This leaves the shell from Sydney, which has been known as *carbonaria*, nameless, and it is here called *Vicimitra contermina*. (Plate 4, fig. 15.)

[169] Hedley.—Proc. Linn. Soc. N.S.W., xxxviii, 1913, pp. 312–314.

Shell rather large, spire attenuate, a little longer than the aperture, but body whorl large, swollen, much longer than the spire, mouth elongate. The apex is missing, eight adult whorls remain, the early whorls regularly spirally grooved, the grooves punctate, the grooves becoming obsolescent as growth proceeds, the penultimate whorl showing from twelve to twenty grooves vanishing on the lower part of the whorl; the last whorl only allows indications below the suture and around the base. The whole shell is uniform dark brown, the aperture purplish, the columella brownish-pink. The outer lip is thickened, simple, a little sinuate, canal short, broad, and open; the columella has six sloping sharply cut plaits, the anterior one smallest. The inner lip is reflected as a slight glaze extending to the posterior angle of the aperture. There are no signs of an umbilicus.

Length, 71 mm.; breadth, 28 mm.; length of aperture, 31 mm.; of body whorl, 46 mm. Type from Sydney Harbour. Animal, creamy white. Habitat, New South Wales.

Family **NASSARIIDAE.**

All the New South Wales members of this family were classed by Hedley in the one genus *Nassarius*, but obviously several distinct groups were represented. The difficulty of determining the groupnames to be used probably was the reason for the policy adopted. I have used *Niotha* for the species Hedley called *N. gemmulatus*, and *Nassarius* may be continued for *particeps* and *spiratus*, but the remainder demand adjustment. Firstly, *coronatus* Bruguière is invalid, and the record of its introduction into the local fauna needs confirmation before any name change can be made, so that for the present it might be omitted from our list. I have been unable to trace any other record of *muricatus* Quoy and Gaimard than in the Check List itself, and conclude its admission was due to some mistake, and for the present it must be rejected. The generic name *Hebra* H. and A. Adams, is available for it or its ally, when refound and re-admitted. When I[170] added *tasmanicus* and discussed *semigranosus* I accepted Hedley's conclusion that *nigella* Reeve was referable to the latter. Among the "Triton" dredgings from Sydney Harbour many specimens of these small "Nassas" were picked out. A small glassy shell was detected, which turned out to be *peritrema*, described from this place, but otherwise commonly known only from the Richmond River beaches. Comparison of the other shells, however, showed that the so-called "*tasmanica*" were undoubtedly Reeve's *nigella*, and that the so-called *semigranosa* (=*nigella* of the paper cited above) must take the name *optata* Gould. Tasmanian shells may retain the name *tasmanica* in a subspecific sense as their sculpture is more pronounced, while the southern representatives of *optata* may be subspecifically differentiated as *munieriana* as they are apparently larger, with more excentric growth, and the mouth always unarmed, whereas in the Sydney *optata* the outer lip develops armature with age. The group seems to be confined to extratropical Australia, and the genus *Taraniotha* is proposed, *optata* being type. Two small species found living on weeds in estuaries and lagoons are recorded as *burchardi* Philippi and *jonasi* Dunker. These are continually being confused, but the *jonasi* is the larger shell with striæ between the ribs, the mouth unarmed and the callus spreading over the body whorl. No locality was known when the species was described, but the figure agrees fairly well with the Sydney shell. Hedley cited *labecula* A. Adams, from the Philippines, as a synonym, but that name can be rejected without hesitation. Reeve named a *mangelioides*[171],

[170] Iredale.—Proc. Linn. Soc. N.S.W., xlix, 24 October, 1924, pp. 270–271.
[171] Reeve.—Conch. Icon., viii, 1853, Nassa. pl. xxiii,. sp. 152, December.

which has been cited here, and from the description and figure it may be regarded as a synonym. Philippi's *burchardi* was described from Adelaide, and our shells differ from the figure and description, and may be called *ellana* sp. nov. the shell being small, longitudinally ribbed, interstices smooth, mouth open, outer lip toothed, lower edge of columella nodulose, a genus *Parcanassa* being provided for this series, which recalls the *thersites* group for which Thiele[172] has proposed the name *Plicarcularia*, but they are of smaller size, stouter build, with less open mouth.

The group around *pauperus* Gould also appears to be nameless, though it is well known; the species are small, corded, more or less longitudinally ribbed, the mouth subcircular, very little inner lip, and outer lip regularly toothed. The new generic name *Reticunassa* is proposed, the Sydney *pauperus* Gould being type. Hedley and May described *Arcularia mobilis*[173] from 100 fathoms, seven miles east of Cape Pillar, Tasmania. A specimen superficially recalling that species was brought in by Mr. Dingeldei, collected by Captain Moller off Newcastle Heads, New South Wales in 40 fathoms. Although agreeing in size and form it was found to be corded not grooved, thirteen cords being counted on the body whorl, and eight on the penultimate, the intervals between the cords broad and faintly longitudinally striate; on the earlier whorls longitudinal ribs occur, succeeding the smooth turbinate two-whorled protoconch. The longitudinals vary from twelve on the post-embryonal whorl to eighteen on the penultimate, vanishing on the last whorl. The outer lid is also toothed, the teeth numbering thirteen agreeing with the cords, which over-run the very large varix. Dimensions, height, 7·5 mm.; breadth, 3·5 mm. This may be named *Reticunassa mobilis plankta* sub. sp. nov., and Hedley's *A. dipsacoides*, from still deeper water, may be placed in the same genus for the present. An overlooked local species is *Nassa mucronata* A. Adams[174], which Mr. R. Blacket brought in from Long Reef, north of Manly, where I had previously found it without recognizing that it was missing from the New South Wales list, as it was a very familiar tropical shell. It is easily recognized by its flattened whorls and somewhat attenuate spire, and rather patulous mouth without any spinose ornament. It has been placed under *Zeuxis*, but it does not correlate with *taenia* Gmelin, the type of *Zeuxis*, while Tryon placed it in *Alectrion* along with *suturalis*, with which it does not agree. It is therefore here made the type of a new subgenus, *Tarazeuxis*.

After the elimination of *coronatus*, *muricatus*, and *pauperatus* the New South Wales list would read: *Nassarius particeps* Hedley, *N. spiratus* A. Adams, *N.* (*Tarazeuxis*) *mucronatus* A. Adams, *Tavaniotha nigella* Reeve, *T. n. tasmanica* Ten-Woods, *T. optata* Gould, *T. o. munieriana* Crosse, *T. peritrema* Ten-Woods, *Parcanassa jonasi* Dunker, *P. ellana* Iredale, *Reticunassa paupera* Gould, *R. mobilis plankta* Iredale, *R. dipsacoides* Hedley, *Niotha comtessei* Iredale and a new species *Niotha hawleyi* described below.

Niotha hawleyi, sp. nov.

(Plate xxiv, fig. 11.)

Shell small, granulose, buccinoid, spire elate, sutures canaliculate, mouth rather open, outer lip slightly denticulate. Coloration: white, marked with brown. Apical whorls about three, glossy, white, ending in a curved varix suggesting a *Sinusugera*. The adult sculpture begins at once, closely packed longitudinal ribs being cut by spirals into evenly spaced pearls. On the penultimate whorl five rows

[172] Thiele.—Handb. syst. Weicht., i, 1929, p. 324.
[173] Hedley and May.—Rec. Austr. Mus., vii, 1908, p. 121, pl. xxiii, fig. 16.
[174] A. Adams.—Proc. Zool. Soc. (Lond.), 1851, p. 105.

of pearls can be counted, the number of pearls in a row being about thirty-three, the subsutural row showing these the most plainly. On the last whorl eleven rows appear, the pearls being more squarely cut. The inner lip is only reflected basally, and extends across the body whorl as a very fine glaze only. The outer lip sweeps rather backward to an open short canal, the outer edge is denticulate and internally about fifteen liræ are present.

Height, 14 mm.; breadth, 8·5 mm.

Habitat.—New South Wales. Type from Sydney Harbour dredgings.

Pterochelus duffusi, sp. nov.

(Plate xxiii, fig. 11.)

The fine shell listed by Hedley as *Murex acanthopterus* Lamarck, had been separated later as needing description, Lamarck's species being a distinct Western Australian shell. When Captain Comtesse picked out a specimen from the harbour dredgings he asked that it might be named as above. The genera of the family Muricidæ were discussed[175], and the supergenera determined from the series in the British Museum (Natural History), but field collecting has proven the sections to be even better distinguished in nature than in museums. Thus, from Hedley's comparison of his *permaestus* to *capucinus*, it might have been regarded as a *Triplex*, whereas upon actual examination it is found to be a *Naquetia* form.

In the present instance, although *Pterochilus*, which is invalid, was earlier written, the emendation *Pterochelus*, a different word, can be utilised. Shell triangularly fusoid, spire a little shorter than aperture, anterior and posterior canals long and open, tri-varicose, varices flattened but not frondose. Dead shell white and rather chalky. Apex missing, six whorls remaining. Sculpture fairly fine striæ only, but subspiral ribs running along to the posterior varix, and a couple more indistinct on the body whorl. Aperture triangularly ovate, with an open canal anteriorly and posteriorly. Columella nearly straight, inner lip reflected as a strong glaze, thickened towards the posterior canal. Varix thin, widely spread, crenulate, outer lip upstanding, smooth within.

Length, 50 mm.; breadth, 41 mm.

Habitat.—New South Wales. Type from Broken Bay.

The Western Australian shell, which is regarded as the true *acanthopterus* Lamarck[176] is larger, more boldly sculptured, especially as regards the varices which are closely frilled, and while the anterior canal is open, the posterior canal is closed.

Genus **Torvamurex**, nov.

(Plate xxiii, fig. 13.)

Type.—*Murex denudatus* Perry.

For *Murex palmiferus* recorded by Angas, Hedley utilized Perry's name of *denudatus*, a name somewhat descriptive of the common Sydney shell. Captain Comtesse sorted out some specimens with well developed frills on the varices, and a very beautiful specimen he contended could not be the same species as the

[175] Iredale.—Trans. New Zeal. Inst., xlvii, 1914, p. 469, 1915.
[176] Lamarck.—Encycl. Meth. Vers, Planche, 417, fig. 2, a, b, Liste, p. 4, 1816.

"denuded" shell. As Perry's species[177] was localised from Van Dieman's Land, and the shell from Victoria most resembles his figure, the name is here restricted to the southern shell, and the common shore shell here may be regarded as a geographical form which is a little more compressed, the nodules between the varices tending to resolve themselves into one large one instead of two smaller ones. The extreme form, which is here named *Torvamurex extraneus* (Plate iv, fig. 12), has developed the frilling of the varices to an abnormal extent, and is distinguished in order to have this development on record. Such a beautiful foliation as is here seen is associated theoretically with still-water conditions. It differs from the typical *denudatus* from Victoria in the presence of only one large nodule between the varices whereas the southern type has definitely two. The frilling is large and the fronds well separated, but in details the finer sculpture and general form resemble those of *denudatus.*

Length, 49 mm.; breadth, 30 mm. Type from Sydney Harbour dredgings.

On the continental shell Murices occur, and these show generally the features of still-water shells, but in this case a form of *denudatus* is found in which the shell is much smaller and the frondose varices obsolescent, thus exactly contrary to theory. It appears narrower, with the spire longer, the canal longer and more open, and showing the single inter-variceal nodule of the shore shells. It is here named *Torvamurex denudatus immunitus* subsp. nov. (Plate xxiii, fig. 14), the type measuring 28 mm. in length and 15 mm. in breadth, collected from 70 fathoms east of Sydney. Mr. W. Dingeldei brought in similar shells from 45 fathoms off Crowdy Head, north of Sydney, and it also occurs off Green Cape, so that it ranges all along the continental shelf of New South Wales.

Typhina pavlova, sp. nov.

(Plate xxiv, fig. 12.)

Among the shells brought in by Captain Moller from trawling in 110 fathoms east of Sydney was a beautiful *Typhina,* characterised by a very long canal and a very long posterior tube.

Shell of medium size, body whorl rather globose, spire short, canal very long. Coloration pinkish, the tubes brownish-red, the same colour occurring basally. Apical whorls missing, five adult whorls, each furnished with four tubes, the last one on the last whorl produced into a long thin tube, the preceding ones being short and squat and somewhat compressed below into an obscure longitudinal rounded rib, only growth striæ showing. The mouth is almost circular, surrounded by an upstanding rim, making the mouth completely free. The posterior tube measures about 10 mm. in length and the anterior canal 13 mm.

Length, 22 mm.; breadth, 8 mm. Type from 110 fathoms east of Sydney. Habitat, New South Wales. On the Continental Shelf, deeper water.

The new subgenus *Choreotyphis* is introduced for this aberrant form.

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[177] Perry.—Conchology, 1811, pl. vii, fig. 2.

Cyphonochelus generosus, sp. nov.

(Plate xxiv, fig. 13.)

Hedley[178] described *Typhis syringianus* from off Cape Three Points, New South Wales, in 45–50 fathoms, a small shell measuring 9 x 5·5 mm., with a very short canal. At the southern end of the Continental Shelf larger specimens occur, which have a longer canal with more regular tube formation. A small rounded dome-like apex, smooth, is succeeded by five whorls, each bearing four tubes preceded by a varicose rib. These tubes fall regularly into line, and there is little sculpture, the growth lines being rather obscure, and only an obsolete spiral striation occurs. The mouth is oval and complete, encircled by an upturned rim, the canal being completely closed, forming a tube.

Length, 12 mm.; breadth, 6 mm. Type from 70–85 fathoms off Green Cape, New South Wales.

Habitat.—New South Wales. On the Continental Shelf, in deeper water.

Dicathais orbita Gmelin.

Again confusion in Martyn between New Zealand and New South Wales occurred in connection with the common shore-living " Whelks," known in both countries until recently as *Purpura succincta.* Martyn localized his species as from New Zealand, but undoubtedly it came from New South Wales. Unfortunately, Martyn's names must be rejected, and in this case Gmelin introduced *Buccinum orbita* for Martyn's species, transferring Martyn's selection to a different shell.

I introduced *Neothais* for the small shells associated with this large species, and advocated its usage, but it may be as well, now that the radular features have been investigated and found to differ, to propose *Dicathais* nov., naming the Sydney species as type. Consequently *Dicathais orbita* will be the name for *Thais succincta* of Hedley's Check List. There appears to be another species in New South Wales, but sufficient material is not yet available to decide.

Architectonica perspectiva Linné.

(Plate xxiii, fig. 20.)

In my last notes I dealt with some species of Architectonicids and rejected *perspectiva,* as the record was apparently based on the species I described as *A. grandiosa.* Almost immediately Mr. Nash brought me in a specimen of the true *perspectiva,* which he had secured at Dundas and separated from his other shells (*grandiosa*) on account of its different coloration. Upon careful comparison this shell was found to agree generally with the Linnean species, but it differed in having an additional subsutural brown band, and the outer keel is regularly spotted on the underside; the sculpture throughout is less pronounced, and the grooves are a little more distant, vanishing on the last whorl. As the coloration seems a constant feature, this shell is named *A. perspectiva fressa* subsp. nov. It measures 39 mm. across, the minor measurement being 35 mm. and is 21 mm. in height.

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178 Hedley.—Mem. Austr. Mus., iv, 1903, p. 381, fig. 94.

Architectonica relata, sp. nov.

(Plate xxiii, fig. 19.)

From 75–85 fathoms, off Bateman's Bay, among some shells trawled were some young and one adult specimen, recalling *Solatisonax injussa*, but upon examination it proved to be a deepwater representative of *Architectonica offlexa*, being more depressed and with obsolescent radial sculpture.

Shell of medium size, conical, base flattened, umbilicus wide, more than one-third the width of the shell. The apex is darker, the coloration being fawnish-white. The longitudinal scuplture is softened, so that it becomes practically obsolete on the last whorl. Spiral grooves, however, become more prominent, and two strong ones persist on the last whorl. The crenulation of the umbilical rib is also much weaker, as is the nodulation of the peripheral keels. The umbilicus is comparatively wider.

Breadth, 25 mm.; height, 12 mm. Continental Shelf of New South Wales.

Family **MANGONUIDÆ**.

Next to *Architectonica* in the same family Hedley placed the genera *Heliacus* and *Discohelix*, though it was well known that the animal of *Heliacus* was very unlike that of *Architectonica* in radular and opercular characters. Years ago I suggested that *Omalaxis meridionalis* Hedley was not referable to *Omalaxis*, and proposed its transference to *Discohelix*, which Hedley adopted. Miss Mestayer[179] has described a near ally of *meridionalis* under the name *Mangonuia bollonsi*, and associated our species in the new genus there proposed, the orthotype being the Neozelanic species. At the same time she suggested that it might represent a distinct family, a solution here accepted. Further, she proposed another genus, *Awarua*, for the species Murdoch and Suter had introduced as *Omalaxis amœna*, and which I had recorded as apparently being merely a juvenile *Heliacus*, using that generic name in a broad sense.

A perfect specimen of Hedley's *meridionalis* was brought in by Dingeldei, picked off the trawl lines by Captain Môller, and two others of a very beautiful shell recalling *amœna*. It was then found that Chapman[180] had described *Homalaxis præmeridionalis* from the Tertiary of Victoria, which is very close to the recent species.

The shell Hedley[181] named *Omalaxis radiata*, from Mast Head Reef, Queensland, has nothing whatever to do with this family, and is here referred to the family Liotiidæ with the new generic name *Liotiaxis*.

Comparisons with the known forms of Heliacoid shells demands the restriction of *Awarua* to the *amœna* type, and provision of a new genus for the shell sometimes known as *Heliacus stramineus*, another for the one above mentioned recalling *amœna*, which is very distinct and beautiful.

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179 Mestayer.—Trans. New Zeal. Inst., lxi, p. 144, 29–31 May, 1930.
180 Chapman.—Proc. Roy. Soc. Vict. (N.S.), xxv, August, 1912, p. 189, pl. xii, figs. 4–6.
181 Hedley.—Proc. Linn. Soc. N.S.W., xxxii, 1907, p. 506, pl. xx, figs. 53–55.

Genus **Torinista**, nov.

(Plate xxiv, fig. 15.)

Type.—*T. popula* sp. nov.

Shell small, subdiscoidal, or perhaps better lentiform, apex anastrophe, umbilicus wide, perspective, about one-third the major diameter of the shell. Coloration of dead shell pale brown. The sculpture of the last whorl may be thus described. Following the suture is a narrow gutter, succeeded by a strong rib cut into lozenges; the periphery is encircled by another stout rib cut into finer lozenges, and between, forming the upper surface of the whorl, lie strong radial liræ cut imperfectly by two encircling grooves. Below the peripheral keel is another similar but weaker keel with a deep groove between; then on the base are four somewhat similar ridges, a little flattened, with wide spaces between and all overriden by strong threads, which almost develop into liræ. The umbilicus is encircled by a thick broad rib, strongly crenulated but not cut into lozenges. The columella is almost perpendicular, ending in a small pseudo-canal; a thin glaze crosses the body whorl to the outer lip which is thin, the mouth circular.

Major diameter, 9·5 mm.; minor diameter, 8 mm.; height, 5 mm.

Habitat.—New South Wales. Type from Sydney Harbour.

Just after this was completed Messrs. C. F. and J. Laseron brought in a smaller shell dredged in a couple of fathoms in North Harbour, Port Jackson. It is flatter, with a wider umbilicus, showing a canaliculate suture through the lower peripheral keel being longer than the upper, and the succeeding whorl joining on it. The sculpture of the under surface is also bolder, so that it is here named *Torinista laseronorum* sp. nov., the shell measuring 6 mm. by 4.5 mm. by 3 mm. It will be figured later.

Claraxis illustris, gen. et. sp. nov.

(Plate xxiv, fig. 16.)

Shell flatly lentiform, sharply angled peripherally, widely openly umbilicate, elegantly sculptured, coloration white. Apex anastrophe, four and a half adult whorls. The sculpture of the last whorl is as follows. Subsuturally there are three ridges, rather weak, then a bold median one, successively a minor one, and then two major, the last forming an angulate keel for the periphery; the base is a little flattened just below this peripheral keel, then swells out into a rounded whorl carrying seven or eight bold ridges right into the umbilical cavity. The ridges of the upper surface are finely cut into lozenges, the outer peripheral keel being very finely closely crenulate; the ridges of the lower surface are more widely spaced, threaded between, and roundly nodulose. The outer lip shows the peripheral keel to be hollow, and then the aperture becomes circular, the columella short, basally rounded, showing no signs of a canal.

Major diameter, 8·5 mm.; minor diameter, 7·5 mm.; height, 4 mm.

Habitat.—Continental shelf of New South Wales. Type from 45 fathoms off Crowdy Head, near Manning River.

Family ELLOBIIDÆ.

The determination of the common little "estuarine" species allowed the discrimination of three species of *Ophicardelus*[182] along the eastern coast of Australia from Port Curtis, Queensland, to Victoria and Tasmania. From the Triton dredgings Mr. E. F. Nash picked out another shell which recalled a small member of this family I had collected at Low Isles, North Queensland. This necessitated re-examination of the other species, and much confusion was found. A similar shell (a distinct species) had been named *Cassidula zonata* by H. and A. Adams from Sydney, and this had been catalogued by Hedley under *Rhodostoma*. That genus was proposed for the large *auris-felis* Linné whose congener, *angulifera* Petit, I had also secured at Low Isles. The small Sydney shell seemed more closely related to some of the species classed in *Ophicardelus*, and, though Gray introduced a number of names for small shells of this family, none seems applicable to our shell, which is here named *Melosidula*, type *C. zonata* H. and A. Adams. The shell, picked out by Nash, agreed fairly well in sculpture with the Low Isles' shells, which appeared to be *granosa*, but is longer in the spire, and with the mouth as in *Melosidula*, the outer lip thickened and with a strong median tooth; it is 8·5 mm. long and 5 mm. broad, the spire nearly as long as the aperture. It is here named *Melosidula granosula* sp. nov. (Plate xxiv, fig. 22).

Connolly[183] showed that *xanthostoma* could not be classed under *Marinula*, which was equivalent to the genus *Cremnobates* as used by Hedley and Suter. The new generic name *Maripythia* is therefore proposed. The generic name *Plecotrema* was shown to be invalid by Sykes[184] when he reviewed the species, but the alternative *Laemodonta* Philippi[185] was introduced for a Sandwich Island shell *striata*, with which our shell does not appear to be congeneric. Apparently *Plecotrema* may be still employed for our species, as Sykes regarded *lirata* as almost inseparable from *typicum*, the orthotype of *Plectotrema*.

Genus Limulatys, nov.

(Plate xxiv, fig. 20.)

Type.—*L. reliquus* sp. nov.

Shell small, shining, thin, elongate oval, not pinched apically, no apical umbilicus, but umbilical fissure at opposite end. Coloration white, with milky spiral lines, towards the ends a faint ridging agreeing with these lines, but otherwise smooth. The apical depression is not perforate, the outer lip longer than the body of the shell, joining the apical hollow with a downward twist. Columella a little sinuate, thin, but umbilical chink clearly shown. Outer lip thin, aperture narrow, a little broadened anteriorly.

Length, 7 mm.; breadth, 4 mm. Type from Sydney Harbour dredgings.

Habitat.—New South Wales.

Another specimen is larger, with the outer lip broken and is white with no milky lines. The shell is sub-keeled medially, the ends of the shell strongly grooved, the grooves more closely packed around the apical depression, which is quite imperforate, the middle section of the shell being smooth. The aperture is longer than the body-whorl, the descending continuation into the apex being strongly twisted. The

[182] Iredale.—Vict. Naturalist, xlii, March, 1926, pp. 268–270, figs. in text.
[183] Connolly.—Ann. S. Afr. Mus., xiii, 1915, p. 116.
[184] Sykes.—Proc. Mal. Soc. (Lond.), i, March, 1895, p. 241.
[185] Philippi.—Zeits. für Malak., 1846, p. 98.

columella is subdentate and strongly preflected over the narrow but distinct umbilicus. Length, 9 mm.; breadth, 4 mm. This may be called *Tepidatys tremens* gen. et sp. nov. Type from Sydney Harbour dredgings.

Habitat.—New South Wales.

Brazier[186] described *Atys cheverti* from Darnley Island and this was figured by Hedley[187]; this species seems to approach the above in general features. Hedley[188] introduced *Atys pransa*, from 100 fathoms off Wollongong, New South Wales, but it was omitted from his Checklist. It is a curious little solid shell, perforate above and below, the apical lip continuation not twisted, the outer lip thickened, sinuate, the columella also thickened; both perforations are deep and the shell is pinched apically and swollen basally. It may not be at all closely related to *Atys*, and the new genus *Spissitydeus* is introduced for it. I mentioned that *Dinia* H. and A Adams[189] was available for *dentifera* A. Adams, but it proves to have been anticipated by Walker[190] some three months earlier. The new generic name *Diniatys* is introduced to replace Adams' name.

Family **ACTEONIDAE.**

Under this name Hedley included the genera *Acteon* Montfort 1810, and *Pupa* Bolten 1798, but the latter being earlier the name should be *Pupidæ.* Under the generic name *Pupa* he included three species, *affinis* A. Adams, *coccinata* Reeve, and *nivea* Angas, only the last named having been described from Australian waters.

Solidula affinis A. Adams was described from China Seas, and the type has been recognized by Smith as merely a small form of *solidula* Linné. Apparently the type has not been figured, as when Watson[191] used the name for a Sydney shell he probably gave an illustration of our species. In any case there appears to be a name for the local shell, as Reeve[192] described *Tornatella fumata* from Australia, and this figure seems applicable to our shell. While Reeve described it as "transversely densely linearly grooved throughout," and this is the normal state (Plate xxiv, fig. 26) specimens may be found almost smooth medially (Plate xxiv, fig. 24). The variation in the sculpture is common in this group, as some shells of *nivea* from Sydney Harbour dredgings also show this state, and thus mimic *intermedia* A. Adams, the South Australian species.

The coloration of *fumata* is fairly constant, some lacking the white lines running round the body whorl, others showing them rather boldly, but the general appearance of a series is uniform. In form some are a little more elongate than others but none are as attenuate as *nivea*, nor swollen as "*coccinata.*" The sculpture does not vary much either, as there are generally six flat-topped liræ on the penultimate whorl separated by narrow grooves. On the body whorl these are normally about twenty-five equal liræ, but these may break up into two in an irregular, and therefore easily noted, fashion and consequently number up to forty unequal liræ. A medium-sized specimen will measure 18 mm. long by 8 mm. broad, the largest 23 mm. by 10 mm. Many specimens were sorted out of the "Triton" dredgings in Sydney Harbour, while it was found alive burrowing in the sand at Gunnamatta Bay, Port Hacking, making a track in the sand like that of the Naticoid shells, but of course very much smaller. The animal had an operculum.

186 Brazier.—Proc. Linn. Soc. N.S.W., ii, 1877. p. 83.
187 Hedley.—Rec. Austr. Mus., iv, 1901, pt. 30, pl. xvii, fig 38.
188 Hedley.—Proc. Linn. Soc. N.S.W., 1904, p. 191, pl. ix, figs. 21-22.
189 H. and A. Adams.—Gen. Rec. Moll., ii, September, 1854, p. 20.
190 Walker.—List Lepid. Brit. Mus., i, ante 1 May, 1854, p. 189.
191 Watson.—Rep. Sci. Res. Challenger Zool., xv, 1886, p. 630, pl. 47, fig. 1.
192 Reeve.—Conch. Icon., xv, June, 1865, pl. iii, fig. 10.

Acteon dolichoroseus, sp. nov.

(Plate xxiv, fig. 27.)

Shell medium, elongate oval, spire acuminate as long as the aperture; whorls seven with initial one smooth; coloration rosy, with subsutural band of white. Sculpture of flattened liræ, narrow, not much broader than interspaces; on last whorl thirty are easily counted, of which some are in duplicate; threads over-ride the whole but are indistinct and do not lattice the interstices of the liræ clearly; on the penultimate whorl eight liræ can be counted and seven on the preceding; the sutures definite but not shouldered. Outer lip thin, sinuate, columella with fold and glaze crossing body to edge of outer lip. Umbilical chink present.

Length, 18·5 mm.; breadth, 8·5 mm.; length of spire, 9 mm. Sydney Harbour dredgings ex " Triton."

Habitat.—New South Wales.

Along with this was a specimen of *roseus* measuring 22 mm. by 13 mm. with spire length 8 mm.

Acteon subroseus, sp. nov.

(Plate xxiv, fig. 25.)

Shell of medium size, elongate oval, spire acuminate, shorter than aperture; whorls seven with initial whorl unsculptured; coloration of living shell brownish white; dead shells chalkwhite.

Sculpture of flat liræ, broader than the interspaces, twenty-five on last whorl, basal ones over-ridden by longitudinal threads which appear in the interstices only on the main part of the whorl, liræ fairly evenly spaced, some of the lower ones divided by a median line; one below suture smaller; seven liræ on penultimate whorl, six on preceding. Outer lip thin, sinuate, columella showing a slight fold, glaze connecting it with the outer lip. No umbilical chink present.

Length, 13 mm.; breadth, 9 mm.; length of aperture, 7 mm.

Continental Shelf from Green Cape to Cape Hawke; type from off Montague Island, 60–70 fathoms. The Continental Shelf *Acteon* was included in Hedley's New South Wales list under the name *austrinus* Watson, but that species was based on a juvenile shell of a *Leucotina*, as Hedley recognized when comparing the type at the British Museum.

Acteon fructuosus, sp. nov.

(Plate xxiv, fig. 28.)

Shell small, oval, spire a little acuminate, shorter than aperture, shining, whorls five, with a smooth tilted apex; coloration white.

Sculpture of flat-topped liræ, crowded, so that interstices appear as linear grooves only: on body whorl there are about thirty, the basal half dozen rounded and separate, showing longitudinal threads, which on the main portion of the whorl are indistinct and negligible. The penultimate whorl shows four broad liræ, with lines between; preceding one, three, with indistinct lining; sutures well impressed, almost canaliculate. Outer lip thin, with columella, showing slight fold and weak glaze connecting with outer lip. Umbilicus deep and narrow.

Length, 8 mm.; breadth, 5·5 mm.

Continental Shelf from Cape Everard northwards to off Sydney. Type from 70 fathoms off Green Cape, southern New South Wales.

Apparently closely related to *Actaeon retusus* Verco[193], from South Australian deep-waters.

Pupa roseomaculata, sp. nov.

(Plate xxiv, fig. 29.)

Fifty years ago Brazier[194], in dredging inside Port Jackson Heads in 5 fathoms found ten specimens of a shell he determined as *Buccinulus coccinatus* Reeve. Since then it had not been met with until Captain Comtesse and Mr. E. F. Nash sorted out three specimens from the Triton dredgings. Reeve described his species from the island of Mindanao, Philippines, and this has been regarded by Smith and Pilsbry as a variation only of *solidula* Linné. The local shell does not agree with Reeve's figure, and is certainly not a variety of Linné's species, so it must be described as new.

Shell of medium size, oval, spire short, body swollen but not obese. Coloration, white with red spots, the spots being spaced on the concentric ridges and arranged more or less linearly in series. Whorls seven, spire not concave sided, less than one-third the length of the aperture.

Sculpture, on penultimate whorl five flat-topped liræ with rather wide interstices, which are crossed by longitudinal threads; on the bodywhorl about twenty-two equal broad flat-topped liræ can be counted, the threaded interspaces being here very narrow. The columellar fold is large and strongly bifid, while the upper parietal fold is prominent and noticeable; only a very fine glaze occurs on the bodywhorl, connecting with the outer lip, which is thin and sharp.

Length, 18 mm.; breadth, 10 mm.: length of aperture, 14 mm. Type from Sydney Harbour dredgings ex " Triton."

Pupa tragulata, sp. nov.

(Plate xxiv, fig. 23.)

Shell small, oval, spire medium, sculptured with coarse flat-topped liræ. Coloration white. Whorls six, spire a little shorter than the aperture. Sculpture of flat-topped liræ separated by comparatively wide grooves, which show distinct longitudinal threading. On the penultimate whorl there are only four liræ, with grooves of equal width, while on the bodywhorl there are about twenty, the basal half dozen being small and more crowded. The shell is more solid than either *nivea* or *fumata*, the outer lip sharp. Columellar lower fold pronounced, upper one notable, a thick glaze crossing to the outer lip.

Length, 10 mm.; breadth, 5·5 mm. Type from off Sydney 75–85 fathoms.

Habitat.—New South Wales. All along the continental shelf.

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193 Verco.—Trans. Roy. Soc. South Austr., xxxi, p. 309, pl. xxix, fig. 12, 1907.
194 Brazier.—Proc. Linn. Soc. N.S.W., iv, p. 429, 1880.

Colsyrnola decolorata, sp. nov.

(Plate xxiv, fig. 14.)

Shell elongate, awl-shaped, shining, twelve whorls, apical ones missing, coloration white, with a golden brown peripheral band. Whorls very narrow, very finely microscopically scratched, sutures well impressed although whorls are straight sided, the sutural crenulation subobsolete. Columella with two plaits, the posterior one prominent, the anterior one indistinct, inner lip reflected, umbilicus narrow, outer lip thin, smooth inside.

Length, 13·5 mm.; breath, 5 mm. Type from Sydney Harbour dredgings.

Habitat.—New South Wales.

Genus **Rhizorus.**

Hedley included two species under the genus *Rhizorus*, *rostratus* A. Adams (from Port Lincoln, South Australia) and *tragula* Hedley. Hedley[195] figured the New South Wales shell as *rostrata*, but pointed out the differences, so that the name *Volvulella parata* is here given to the figured specimen, as *Rhizorus* was given to a different Mediterranean shell. Thiele[196] has used *Volvula* A. Adams 1850 (Synonym, *Volvulella* R. B. Newton 1891), for the Mediterranean species, overlooking Montfort's *Rhizorus* altogether. *Volvula* A. Adams was rejected by R. B. Newton on account of a prior *Volvulus*, but Pilsbry demurred and used *Volvula* even as Thiele has done. There is, however, a prior *Volvula* Gistel[197] which settles all arguments, and as Bucquoy, Dautzenberg, and Dollfus named *rostrata* as type of *Volvula* A. Adams, Newton's alternative must be used for the Australian shell.

Genus **Ringiculadda,** nov.

Type.—*Ringicula semisculpta* Hedley.

When Hedley[198] introduced *Ringicula semisculpta* from 100 fathoms 40 miles south of Cape Wiles, South Australia, he also recorded it from 80 fathoms off Narrabeen, and 300 fathoms off Sydney, New South Wales, but omitted it by accident from his New South Wales Checklist.

Specimens are being found among the recent trawled material, and these prove upon comparison to be proportionately narrower but otherwise similar, so that they may be named *Ringiculadda semisculpta frigidula* subsp. nov., the type being from 110 fathoms off Sydney, 4·5 mm. in height by 3 mm. wide. The type of *Ringicula* is a fossil, *R. ringens*, and Morlet[199] monographed the species of the genus, and the fossil is not much like our forms, which are smaller, with less callus on the bodywhorl, the teeth less notable, especially the parietal one, which is often missing, and the outer lip less variced.

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[195] Hedley.—Mem. Austr. Mus., iv, 1903, p. 394, fig. 109.
[196] Thiele.—Handb. syst. Weicht., ii, 1931, p. 390.
[197] Gistel.—Nat. Thierr hoh. Schulen., 1848, p. viii.
[198] Hedley.—Zool. Res. Endeavour, 1909–10, i, 1911, p. 113, pl. xx, figs. 39–40, 22 December.
[199] Morlet.—Journ. de Conch., xxvi, 1878, pp. 113–133, April, and pp. 251–295, 1 July.

Genus **Ventomnestia**, nov.

(Plate xxiv, fig. 21.)

Type.—*V. colorata* sp. nov.

Mr. H. S. Mort picked out of the Harbour dredgings a small Cylichnid, which, bearing grooves, is at once separable from the New South Wales species, and, recalling the Queensland shells known as *Cylichna bizona* A. Adams, was compared and found to agree. Mr. Dingeldei at the same time found a second specimen.

Bulla bizona was described by A. Adams[200] from the China Sea, and Australian specimens, though superficially resembling them, are not reticulately sculptured as Adams described, so that they cannot be regarded as identical.

In 1854, H. and A. Adams[201] proposed *Mnestia* for *bizona* A. Adams and *marmorata* A. Adams. In the Illustr. Conch., Kobelt[202] misspelt the name *Morestia*, and named as type, *marmorata* A. Adams,[203] which is quite different from our species, and certainly not congeneric with *bizona*. This action must be confirmed by definitely stating that *Bulla marmorata* is the type of *Mnestia*, and naming the group to which *bizona* is referable.

The Sydney shell may be described as follows :—Shell small, cylindrical, narrowly deeply perforate, columella straight, inner lip reflected, outer lip extending above the apex. The coloration of the dead shell is cream, with a broad pale brown band. The sculpture consists of wavy concentric grooves, rather irregularly spaced, the apical umbilicus smooth.

Length, 6 mm.; breadth, 2·5 mm. Type from Sydney Harbour dredgings.

Habitat.—New South Wales.

Quite unlike the local Cylichnids, such as *C. thetidis* Hedley and "*C. arachis* Q. and G.," which are larger, thinner, smoother and with a definite twist on the columella. The New South Wales shell known as *C. arachis* differs from the West Australian type in the apical umbilicus, which is much narrower. The radular characters have been recorded as approaching those of *Haminœa* more than those of *Cylichna*, so the new generic name *Adamnestia* is introduced, the New South Wales form being named *Adamnestia peroniana* and selected as type.

Family **HYDATINIDAE.**

This name has priority over Hedley's choice Aplustridæ, and the species Hedley included under the genus *Aplustrum* is so different that Pilsbry[204] introduced the name *Austrodiaphana*, which must now be utilized, while Pilsbry placed it in his family Scaphandridæ.

Through the rejection of Martyn's names, *circulata* Martyn must now give way to *zonata* Solander,[205] a name given to the shell figured by Born[206] as *Bulla amplustre* Linné, but which was not the Linnean species. Born's locality was "Asia," but Solander gives "China," where it may occur.

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200 A. Adams.—Thes. Conch (Sow.), pt. xi, (Vol. ii), p. 595, pl. 125, fig. 148, 1850.
201 H. and A. Adams.—Gen. Rec. Moll., ii, p. 10, 1854.
202 Kobelt.—Illustr. Conchyl., lief. 6, p. 172, 1878.
203 A. Adams.—Thes. Conch. (Sow.), pt. xi, (Vol. ii). p. 594, pl. 125, fig. 145, 1850.
204 Pilsby.—Man. Conch. (Tryon), xv, 1893, p. 287.
205 Solander.—Cat. Portland Museum, (ante 24 April) 1786, p. 164, lot 3561; p. 175, lot 3758.
206 Born.—Mus. Cæs. Vindob., 1780, p. 204, pl. ix, fig. 1.

A few years later Gmelin[207] introduced *Bulla velum*, giving for references Martin neust Mannig, p. 409, t. 1, f. 10, and Chemn. Conch., 10, t. 146, f. 1348, 1349, the locality of the latter reference being Tranquebar.

There is a conchological difference between the shells of *cinctoria* Perry and *zonata* Solander, when compared with that of the type of *Hydatina*, *physis* Linné, and comparison of the animals will most probably indicate greater differences. A subgeneric name *Hydatoria* is here provided, *cinctoria* Perry being named as type. It may be noted that the somewhat variable shell of "*physis* Linné" has defied separation on conchological characters, but animal features may provide a solution. Thus Risbec[208] has published a drawing of the egg-string of the New Caledonian "*physis*," which looks very unlike that[209] of the local shell called "*physis*."

The curious little shell which Hedley[210] called *Hydatina exigua* is obviously not congeneric with the preceding species, and is here distinguished generically with the new name *Noalda*. It is less than two millimetres in length and breadth, and the apex is quite different from that of *Hydatina*, the body whorl being also comparatively smaller, the mouth consequently more open.

A list of new names proposed in this essay follows hereunder :—

Destacar gen. nov. Type *Arca metella* Hedley.
Samacar gen. nov. Type *Arca strabo* Hedley.
Lopha hyotis notina subsp. nov.
Saxostrea gen. nov. Type *Ostrea commercialis* Iredale and Roughley.
Dimyarina gen. nov. Type *Dimya corrugata* Hedley.
Monia deliciosa sp. nov.
Anomia descripta sp. nov.
Musculus ulmus sp. nov.
Quendreda gen. nov. Type *Dacrydium fabale* Hedley.
Eucrassatella cumingii wardiana subsp. nov.
baxteri subsp. nov.
kingicola verconis subsp. nov.
genuina sp. nov.
Volupicuna subgen. nov. Type *Carditella delta* Tate and May.
Saltocuna gen. nov. Type *Cuna particula* Hedley.
Cunanax gen. nov. Type *Cuna pisum* Hedley.
Condylocuna gen. nov. Type *Condylocardia projecta* Hedley.
cambrica sp. nov.
Radiocondyla gen. nov. Type *Radiocondyla arizela* Iredale.
arizela sp. nov.
Carditellona gen. nov. Type *Carditella angasi* Smith.
Carditellopsis gen. nov. Type *Carditella elegantula* Tate and May.
Talocodakia subgen. nov. Type *Epicodakia kennethi* Iredale.
Epicodakia kennethi sp. nov.
Divalucina gen. nov. Type *Lucina cumingii* A. Adams and Angas.
cumingii bardwelli subsp. nov.
Toralimysia gen. nov. Type *Toralimysia excentrica* Iredale.
excentrica sp. nov.

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207 Gmelin.—Syst. Nat., pt. vi, 1791, p. 3433.
208 Risbec.—Arch. Mus. d'Hist. Nat. (Paris), (6), iii, 1928, p. 40, text fig. 6.
209 McNeill and Livingstone.—Austr. Mus. Mag., iii, 1928, p. 240, fig. in text.
210 Hedley.—Rec. Aust. Mus., viii, 1912, p. 158, pl. 45, fig. 46.

Byssobornia subgen. nov. Type *Bornia filosa* Hedley.
Marikellia gen. nov. Type *Kellia solida* Angas.
Ambuscintilla gen. nov. Type *Ambuscintilla præmium* Iredale.
præmium sp. nov.
Regozara gen. nov. Type *Regozara olivifer* Iredale.
olivifer sp. nov.
Redicirce gen. nov. Type *Redicirce mistura* Iredale.
Redicirce mistura sp. nov.
consola sp. nov.
Pitarina osmunda sp. nov.
Granicorium attonitum sp. nov.
Katelysia enigma sp. nov.
Paratapes scordalus sp. nov.
Acritopaphia gen. nov. Type *Acritopaphia transfusa* Iredale.
transfusa sp. nov.
Glauconometta gen. nov. Type *Glauconometta plankta* Iredale.
plankta sp. nov.
Tellinota gen. nov. Type *Tellinota roseola* Iredale.
roseola sp. nov.
Pristipagia gen. nov. Type *Pristipagia gemonia* Iredale.
gemonia sp. nov.
Pinguimacoma gen. nov. Type *Pinguimacoma hemicilla* Iredale.
hemicilla sp. nov.
Milligaretta gen. nov. Type *Milligaretta venta* Iredale.
venta sp. nov.
Flavomala gen. nov. Type *Solen biradiatus* Wood.
Florisarka gen. nov. Type *Florisarka onuphria* Iredale.
onuphria sp. nov.
Distugonia gen. nov. Type *Distugonia inopinata* Iredale.
inopinata sp. nov.
Ensiculus hilaris sp. nov.
Minolops gertruda sp. nov.
Benthastelena gen. nov. Type *Benthastelena katherina* Iredale.
katherina sp. nov.
Mazastele gen. nov. Type *Trochus glyptus* Watson.
Partubiola gen. nov. Type *Partubiola blancha* Iredale.
blancha sp. nov.
Larinopsis ostensus sp. nov.
Smaragdista gen. nov. Type *Smaragdista tragena* Iredale.
tragena sp. nov.
Pictoneritina gen. nov. Type *Neritina oualanensis* Lesson.
Anafossarus gen. nov. Type *Fossarus sydneyensis* Hedley.
Diffalaba gen. nov. Type *Diffalaba opiniosa* Iredale.
opiniosa sp. nov.
Ataxocerithium conturbatum sp. nov.
scruposum sp. nov.
applenum sp. nov.
Geminataxum subgen. nov. Type *Ataxocerithium applenum* Iredale.
Velacumantus gen. nov. Type *Cerithium australe* Quoy and Gaimard.
Gazameda decoramen sp. nov.

Sirius meracus sp. nov.
desponsus subsp. nov.
chrestus subsp. nov.
Separatista fraterna sp. nov.
Halotapada gen. nov. Type *Halotapada nubila* Iredale.
nubila sp. nov.
Tropidorbis gen. nov. Type *Tropidorbis mendicus* Iredale.
mendicus sp. nov.
Sigaretornus gen. nov. Type *Adeorbis sigaretinus* Pilsbry.
Mazescala gen. nov. Type *Mazescala thrasys* Iredale.
thrasys sp. nov.
heloris sp. nov.
Laeviscala tacita sp. nov.
Acutiscala minoa sp. nov.
ampacta sp. nov.
fabia sp. nov.
coreta sp. nov.
christyi sp. nov.
Pudentiscala subgen. nov. Type *Acutiscala christyi* Iredale.
Limiscala helicornua sp. nov.
Obstopalia gen. nov. Type *Obstopalia lixa* Iredale.
lixa sp. nov.
Solvaclathrus gen. nov. Type *Solvaclathrus jacobiscala* Iredale.
jacobiscala sp. nov.
Folaceiscala carchedon sp. nov.
barissa sp. nov.
antisoa sp. nov.
pindasa sp. nov.
Crenuliscala subgen. nov. Type *Folaceiscala pindasa* Iredale.
Narvaliscala gen. nov. Type *Narvaliscala dorysa* Iredale.
dorysa sp. nov.
Murdochella macrina sp. nov.
Dissopalia gen. nov. Type *Scala turrisphari* Hedley.
Plastiscala gen. nov. Type *Scala morchi* Angas.
morchi bentha subsp. nov.
profundior subsp. nov.
Pomiscala gen. nov. Type *Scala perplicata* Iredale.
Dannevigena gen. nov. Type *Dannevigena martyr* Iredale.
martyr sp. nov.
Nodiscala apostolorum sp. nov.
Rectacirsa gen. nov. Type *Rectacirsa fregata* Iredale.
Rectacirsa fregata sp. nov.
Cymatilesta gen. nov. Type *Septa spengleri* Perry.
Cabestanimorpha gen. nov. Type *Triton exaratus Reeve.*
Particymatium gen. nov. Type *Tritonium strangei* A. Adams and Anga
Septa ? blacketi sp. nov.
Cymatilesta waterhousei tepida subsp. nov.
Ranularia sinensis defrenata subsp. nov.
Tritonocauda caudata vulticula subsp. nov.
Vernotriton gen. nov. Type *Lotorium pumilio* Hedley.
Phanozesta gen. nov. Type *Phanozesta remensa* Iredale.

Phanozesta remensa sp. nov.
Apollon facetus sp. nov.
Apollon deliberatus sp. nov.
Annaperenna gen. nov. Type *Ranella verrucosa* Sowerby.
Quantonatica subgen. nov. Type *Natica subcostata* Tenison-Woods.
Notocochlis cothurnata sp. nov.
Notocochlis schoutanica diatheca subsp. nov.
Mammilla plumatilis sp. nov.
Marseniopsis innominatus sp. nov.
Diminovula manifesta sp. nov.
Relegamoria gen. nov. Type *Relegamoria molleri* Iredale.
molleri sp. nov.
Ancillista gen. nov. Type *Ancillista velesiana* Iredale.
velesiana sp. nov.
Columbarium hedleyi sp. nov.
trabeatum sp. nov.
Colus genticus sp. nov.
Fractolatirus gen. nov. Type *Fractolatirus normalis* Iredale.
normalis sp. nov.
Benthindsia gen. nov. Type *Benthindsia problematica* Iredale.
problematica sp. nov.
Sydaphera obnixa sp. nov.
Arizelostoma gen. nov. Type *Arizelostoma laseroni* Iredale.
laseroni sp. nov.
Trigonaphera gen. nov. Type *Trigonostoma vinnulum* Iredale.
Benthofascis gen. nov. Type *Bathytoma biconica* Hedley.
Micantapex gen. nov. Type *Bathytoma agnata* Hedley.
Lucerapex gen. nov. Type *Pleurotoma casearia* Hedley.
casearia regilla subsp. nov.
Vicimitra exposita sp. nov.
contermina sp. nov.
Tavaniotha gen. nov. Type *Nassa optata* Gould.
Parcanassa gen. nov. Type *Parcanassa ellana* Iredale.
ellana sp. nov.
Reticunassa gen. nov. Type *Nassa paupera* Gould.
mobilis plankta subsp. nov.
Tarazeuxis subgen. nov. Type *Nassa mucronata* A. Adams.
Niotha hawleyi sp. nov.
Pterochelus duffusi sp. nov.
Torvamurex gen. nov. Type *Murex denudatus* Perry.
extraneus sp. nov.
denudatus immunitus subsp. nov.
Typhina pavlova sp. nov.
Choreotyphis subgen. nov. Type *Typhina pavlova* Iredale.
Cyphonochelus generosus sp. nov.
Dicathais gen. nov. Type *Buccinum orbita* Gmelin.
Architectonica perspectiva fressa subsp. nov.
relata sp. nov.
Liotiaxis gen. nov. Type *Omalaxis radiata* Hedley.
Torinista gen. nov. Type *Torinista popula* Iredale.
popula sp. nov.

Torinista laseronorum sp. nov.
Claraxis gen. nov. Type *Claraxis illustris* Iredale.
illustris sp. nov.
Melosidula gen. nov. Type *Cassidula zonata* H. and A. Adams.
granosula sp. nov.
Maripythia gen. nov. Type *Marinula xanthostoma* H. and A. Adams.
Limulatys gen. nov. Type *Limulatys reliquus* Iredale.
reliquus sp. nov.
Tepidatys gen. nov. Type *Tepidatys tremens* Iredale.
tremens sp. nov.
Spissitydeus gen. nov. Type *Atys pransa* Hedley.
Diniatys gen. nov. Type *Atys dentifera* A. Adams.
Acteon dolichoroseus sp. nov.
subroseus sp. nov.
fructuosus sp. nov.
Pupa roseomaculata sp. nov.
tragulata sp. nov.
Colsyrnola decolorata sp. nov.
Volvulella parata sp. nov.
Ringiculadda gen. nov. Type *Ringicula semisculpta* Hedley.
semisculpta frigidula subsp. nov.
Ventomnestia gen. nov. Type *Ventomnestia colorata* Iredale.
colorata sp. nov.
Adamnestia gen. nov. Type *Adamnestia peroniana* Iredale.
peroniana sp. nov.
Hydatoria subgen. nov. Type *Bulla cinctoria* Perry.
Noalda gen. nov. Type *Hydatina exigua* Hedley.

EXPLANATIONS OF PLATES.

PLATE XX.

Fig. 1.—*Cucullaea vaga* Iredale.
Fig. 2.—*Lopha hyotis notina* Iredale.
Fig. 3.—*Decatopecten strangei* Reeve.
Fig. 4.—*Eucrassatella genuina* Iredale.
Fig. 5.—*Batissa australis* Deshayes.
Fig. 6.—*Anomia descripta* Iredale.
Figs. 7, 7a.—*Monia deliciosa* Iredale.
Fig. 8.—*Regozara olivifer* Iredale.
Figs. 9, 9a.—*Pitarina osmunda* Iredale.
Fig. 10.—*Epicodakia kennethi* Iredale.
Fig. 11.—*Paratapes scordalus* Iredale.
Fig. 12.—*Acritopaphia transfusa* Iredale.
Fig. 13.—*Katelysia enigma* Iredale.
Fig. 14.—*Florisarka onuphria* Iredale.
Fig. 15.—*Ensiculus hilaris* Iredale.
Fig. 16.—*Glauconometta plankta* Iredale.
Fig. 17.—*Granicorium attonitum* Iredale.
Fig. 18.—*Tellinota roseola* Iredale.
Fig. 19.—*Flavomala biradiata* Wood.

Plate XXI.

Fig. 1.—*Musculus cumingianus* Reeve.
Fig. 2.—*Borniola filosa* Hedley.
Fig. 3.—*Redicirce mistura* Iredale.
Fig. 4.—*Ambuscintilla praemium* Iredale.
Fig. 5.—*Redicirce consola* Iredale.
Fig. 6.—*Pristipagia gemonia* Iredale.
Fig. 7.—*Pinguimacoma hemicilla* Iredale.
Fig. 8.—*Milligaretta venta* Iredale.
Figs. 9, 9a.—*Distugonia inopinata* Iredale.
Fig. 10.—*Musculus ulmus* Iredale.
Fig. 11.—*Minolops gertruda* Iredale.
Fig. 12.—*Benthastelena katherina* Iredale.
Fig. 13.—*Partubiola blancha* Iredale.
Fig. 14.—*Smaragdista tragena* Iredale.
Fig. 15.—*Liotina scalaris* Hedley.
Fig. 16.—*Diffalaba opiniosa* Iredale.
Fig. 17.—*Ataxocerithium conturbatum* Iredale.
Fig. 18.—*Ataxocerithium scruposum* Iredale.
Fig. 19.—*Ataxocerithium applenum* Iredale.
Fig. 20.—*Gazameda decoramen* Iredale.
Fig. 21.—*Sirius meracus* Iredale.
Fig. 22.—*Halotapada nubila* Iredale.

Plate XXII.

Fig. 1.—*Lamelliscala parspeciosa* Iredale.
Fig. 2.—*Mazescala thrasys* Iredale.
Fig. 3.—*Mazescala heloris* Iredale.
Fig. 4.—*Mazescala bellicosa* Hedley.
Fig. 5.—*Laeviscala tacita* Iredale.
Fig. 6.—*Acutiscala minoa* Iredale.
Fig. 7.—*Acutiscala ampacta* Iredale.
Fig. 8.—*Acutiscala fabia* Iredale.
Fig. 9.—*Acutiscala coreta* Iredale.
Fig. 10.—*Acutiscala christyi* Iredale.
Fig. 11.—*Limiscala helicornua* Iredale.
Fig. 12.—*Obstopalia lixa* Iredale.
Fig. 13.—*Folaceiscala carchedon* Iredale.
Fig. 14.—*Solvaclathrus jacobiscala* Iredale.
Fig. 15.—*Folaceiscala barissa* Iredale.
Fig. 16.—*Folaceiscala antisoa* Iredale.
Fig. 17.—*Folaceiscala pindasa* Iredale.
Fig. 18.—*Narvaliscala dorysa* Iredale.
Fig. 19.—*Murdochella macrina* Iredale.
Fig. 20.—*Dissopalia turrisphari* Hedley.
Fig. 21.—*Plastiscala morchi* Angas.
Fig. 22.—*Plastiscala morchi profundior* Iredale.
Fig. 23.—*Plastiscala morchi bentha* Iredale.
Fig. 24.—*Pomiscala perplicata* Iredale.
Fig. 25.—*Dannevigena martyr* Iredale.
Fig. 26.—*Opalia australis* Lamarck.
Fig. 27.—*Nodiscala apostolorum* Iredale.
Fig. 28.—*Nodiscala fregata* Iredale.
Fig. 29.—*Scalaria distincta* Smith.
Fig. 30.—*Granuliscala ballinensis* Smith.

Plate XXIII.

Fig. 1.—*Tritonocauda caudata vulticula* Iredale
Fig. 2.—*Ranularia sinensis defrenata* Iredale.
Fig. 3.—*Septa ? blacketi* Iredale.
Fig. 4.—*Phanozesta remensa* Iredale.

Fig. 5.—*Colus genticus* Iredale.
Fig. 6.—*Sydaphera obnixa* Iredale.
Fig. 7.—*Benthindsia problematica* Iredale.
Fig. 8.—*Volva volva cumulata* Iredale.
Fig. 9.—*Ancillista velesiana* Iredale.
Fig. 10.—*Relegamoria molleri* Iredale.
Fig. 11.—*Pterochelus duffusi* Iredale.
Fig. 12.—*Torvamurex extraneus* Iredale.
Fig. 13.—*Torvamurex denudatus* Perry.
Fig. 14.—*Torvamurex denudatus immunitus* Iredale.
Fig. 15.—*Vicimitra contermina* Iredale.
Fig. 16.—*Vicimitra exposita* Iredale.
Fig. 17.—*Columbarium trabeatum* Iredale
Fig. 18.—*Mammilla plumatilis* Iredale.
Fig. 19.—*Architectonica relata* Iredale.
Fig. 20.—*Architectonica perspectiva fressa* Iredale.

PLATE XXIV.

Fig. 1.—*Tropidorbis mendicus* Iredale.
Fig. 2.—*Cymatona kampyla* Watson; apical whorls.
Fig. 3.—*Apollon facetus* Iredale.
Fig. 4.—*Apollon deliberatus* Iredale.
Fig. 5.—*Phanozesta remensa* Iredale; apical whorls.
Fig. 6.—*Notocochlis cothurnata* Iredale.
Fig. 7.—*Notocochlis schoutanica diatheca* Iredale.
Fig. 8.—*Marseniopsis innominatus* Iredale.
Fig. 9.—*Arizelostoma laseroni* Iredale.
Fig. 10.—*Diminovula manifesta* Iredale.
Fig. 11.—*Niotha hawleyi* Iredale.
Fig. 12.—*Typhina pavlova* Iredale.
Fig. 13.—*Cyphonochelus generosus* Iredale.
Fig. 14.—*Colsyrnola decolorata* Iredale.
Fig. 15.—*Torinista popula* Iredale.
Fig. 16.—*Claraxis illustris* Iredale.
Fig. 17.—*Larinopsis ostensus* Iredale.
Figs. 18, 18a.—*Columbarium hedleyi* Iredale.
Fig. 19.—*Fractolatirus normalis* Iredale.
Fig. 20.—*Limulatys reliquus* Iredale.
Fig. 21.—*Ventomnestia colorata* Iredale.
Fig. 22.—*Melosidula granosula* Iredale.
Fig. 23.—*Pupa tragulata* Iredale.
Fig. 24.—*Pupa fumata* Reeve; medially smooth.
Fig. 25.—*Acteon subroseus* Iredale.
Fig. 26.—*Pupa fumata* Reeve; completely grooved.
Fig. 27.—*Acteon dolichoroseus* Iredale.
Fig. 28.—*Acteon fructuosus* Iredale.
Fig. 29.—*Pupa roseomaculata* Iredale.

THE MAMMALIAN FAUNA OF BOUGAINVILLE ISLAND, SOLOMONS GROUP.

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Although Bougainville Island is essentially a zoo-geographical part of the Solomons, annexation by Germany and subsequent transfer under mandate to Australia has rather inaptly linked it politically as well as postally with the more distant Bismarck Archipelago, so that it is sometimes regarded as being an intermediate or buffer island between those groups. Actually, more than one hundred miles of open ocean separate Bougainville from New Ireland, whereas to the south only the twenty-six odd miles of Bougainville Strait, obstructed by numerous islands, separates it from the large island of Choiseul, a distance also scarcely exceeded between any of the larger islands of the group.

Considerable faunistic interest therefore attaches to Bougainville as a base of deployment for the mammals found within the Solomons—a fact which, coupled with ts size and rugged nature, accounts for the relatively rich variety of mammals secured there recently for the Australian Museum by the Reverend J. B. Poncelet, S.M., of the Catholic Mission at Buin, South Bougainville. Largest of the group, discovered by Mendana in 1567, the island is about one hundred and ten miles long and from twenty to thirty-five miles wide, with a volcano erupting at intervals from a 6,000-ft. peak of the mountain range, which extends throughout its length and attains in Mount Balbi the astonishing altitude of 10,171 feet.

Owing to the great elevation, and rugged and mainly shelving coastline, which formed a natural barrier in overcoming the ferocity of the inhabitants, Bougainville was until recently the least known of the group. It is less than fifty years since missionaries began their civilizing work at Buin, the southern point facing the remainder of the group, and then only after great difficulty in getting hold of a few sickly natives and proving their friendly intentions by kindly treatment and cures was it possible to venture forth without firearms.

At present there are inland parts where the natives have not yet made contact with whites, and in May, 1935, a newspaper reported the experience of a missionary who penetrated the mountains in search of an unknown community. Armed only with a walking stick and accompanied by nine mission boys, he eventually located the settlement, where the natives were so amazed at the colour of the first European seen that they actually rubbed his skin to make certain the colour was not painted on. Discussing his fate, the natives apparently concluded that a man of peace was not worth killing, to the relief of the priest, who said he was naturally terrified, as the natives, though not cannibals in the sense of killing to eat, have been known to kill and feast upon intruders.

Although government stations and plantations are now well established and a palm-shaded road runs along the coast, and the known natives are nearly all friendly towards strangers, in spite of submitting to civilized taxation, past difficulties and dangers evidently kept the large island a close preserve from explorer-naturalists and

collectors. Even that indefatigable naturalist and administrator the late C. M. Woodford, C.M.G., who sent the first comprehensive collection of birds and mammals from the Solomons to England in 1886-7, and remained as Resident Commissioner of the British Solomons from 1896 to 1915, apparently never visited, and certainly never collected at Bougainville, although he reported that natives of the nearby Shortland and Fauro islands spoke of a Cuscus being found there.

In view of the above, Father Poncelet's offer to collect for the Australian Museum, made during a visit in 1934, was gladly accepted and has so far resulted in the acquisition of over a hundred specimens of mammals alone, representing thirteen genera, one of which has already been described as new. Of the species, five are now described as new, while six others are recorded for the first time from Bougainville.

As far as one can ascertain, of the mammals, only three bats—*Pteropus grandis*, *Pteralopex anceps*, and *Hipposideros diadema oceanitis*—have previously been described or definitely recorded from the island. When it is noted of these that the *Pteropus* is the only species duplicated in the recent collection, the importance of Father Poncelet's contribution to science may be realized, and also the pleasure with which his name was associated with the outstanding novelty, the new genus of giant rat described in the preceding part of the *Records*, as well as with the pipistrel of the Solomons in this paper.

The remarkable thoroughness of the collector is emphasized by the fact that most of the carefully tabulated material, which also includes insects, fishes, and reptiles, was secured in densely wooded country about ten miles inland from Buin, where heat and the prevailing dampness must have added greatly to the usual difficulties of the capture and preservation of mammals.

Phalanger orientalis breviceps Thomas.

Phalanger orientalis breviceps Thomas, Cat. Mars. and Monotr. Brit. Mus., 1888, p. 204. San Christoval Island, Solomons Group.

Comparison of the cranial and external measurements of five females and a male from Bougainville with the dimensions given by Thomas, and those of Museum specimens from Ysabel, indicates that this form cannot retain the specific status which was subsequently accorded by its author. Originally, Thomas listed the skull of an adult female from Alu, near Shortland Island, in the north-west Solomons, and an adult female in spirit from Rubiana, near New Georgia, in the middle region, the respective dental and external dimensions of which agreed with the relatively small size of the type from San Christoval in the extreme south-east of the group. A comparison of detailed measurements shows the Bougainville series averaging slightly larger, but any implied distinction is negatived by intergradation shown by the Ysabel series, apart from individual variation.

A similar intergradation appears to render *Ph. orientalis ducatoris* Thomas[1] from Duke of York Island of doubtful subspecific distinction, though it should probably be retained as a convenient geographical race. It is notable that Thomas regarded it as an intermediate form, which doubtless inhabited New Britain and New Ireland as well, and, lacking a male, was in doubt if such would exhibit the greatly developed supraorbital crests of that sex of *breviceps*. Two skulls of adult

[1] Thomas.—Ann. Mag. Nat. Hist., (9) ix, 1922, p. 680.

males from New Britain are in the collection, received from Rev. George Brown, who provided the British Museum holotype in 1878, with which their dimensions accord, while the supraorbital crests are as strongly developed as in males of *breviceps*.

The slightness of the distinction of *ducatoris* from *breviceps* is shown by the pes of a Bougainville adult male attaining 60 mm. compared with 62 mm. given for the adult female *ducatoris*, while a young female with pm^4 and m^4 not fully erupted has the length of molars 1–3 equalling, and the horizontal length of pm^4 (3·9–4·1) including that given for the holotype *ducatoris*.

Because of the recognised colour variability of most species of Cuscus, it would seem that these two insular races are mainly differentiated from the typical one by the smaller pm^4 measuring 3·9–4·1 against 5–5·1, while the presence on Bougainville and Ysabel of somewhat larger animals than those examined by Thomas from the Solomons, indicates that *breviceps* is not specifically distinct, and that *ducatoris* is barely distinguishable subspecifically from it, though its distribution in the eastern area of the Bismarck Archipelago is confirmed.

Rattus praetor mediocris subsp. nov.

Diagnosis.—A warmer coloured and somewhat larger form than the typical race from Guadalcanar, with a shorter ear, tail averaging longer, and longer palatal foramina and molars. Habitat: Bougainville Island.

Colour.—General of back about grizzled sayal brown (Ridgway's "Colour Standards") contrasted with the "grizzled grey" of the typical form, the browner element being due to the light tipping varying from cinnamon to cinnamon-rufous in two males, while the dark tips are not black but of a dark fuscous brown. Sides becoming paler owing to reduction of grizzling and the smoke-grey of the underfur showing through, but contrasting in a well-defined line with the pale olive-buff under-surface. There is a pinkish-cinnamon wash on the sides of the head, the outer arm is dark hair brown, which extends as a contrasted mark on the wrist; both manus and pes are sparsely covered with brownish and pale yellow hairs, and the back of the ear and the tail is blackish-brown.

External characters.—Pelage a fairly sparse but even admixture of coarse spines and very soft underfur, the average length of the spiny hairs about 15 mm. and the longest piles about 30 mm.; spines of under-surface about 9 mm. long. Ear shorter than in typical form, reaching about two-thirds of the distance to, instead of reaching, the posterior canthus of the eye, when pressed forward. The hindfoot is of similar size but the tail averages somewhat longer.

Skull and dentition.—Size of skull apparently similar, but the bullæ probably larger and the supraorbital ridges more strongly marked, the beading expanded outwards in the orbital region and continuing clearly to the outer corners of the interparietal. Palatal foramina longer than in the holotype of the typical form, their hind edges slightly overlapping the front ends of molars. Upper molar row longer, and probably broader, than in the typical form.

Dimensions of holotype male.—Head and body 196; tail 149; pes 38·5; ear 18·5 x 14·5 mm.

Skull: Greatest length 44·2; basal length 39·4; zygomatic breadth 23; interorbital width 6·9; nasals 16·6 x 5·4; palatal length 24; palatal foramina 8·1 x 3·2; upper molar row 7·7; width of m^1 2·3; bulla 6·2 x 6·2*.

* Width of bulla includes meatal tubercle.

Specimens examined.—Holotype adult male No. M. 5761, and two paratype adult males Nos. M. 5759–60, in the Australian Museum collection, taken at Buin, Bougainville, by the Rev. J. B. Poncelet, S.M. The native names Inakia and Kamaide were applied, the latter to *Solomys* also.

Remarks.—When amplifying his brief diagnosis in the Proceedings of the Zoological Society for 1888, Thomas stated that there was a skin of the species in the British Museum from New Britain, collected by the Rev. G. Brown, which agreed with Woodford's Guadalcanar specimens in every respect. Apparently, however, the skull was not available, which would doubtless have confirmed the interesting extension of range, and would also probably have shown subspecific distinctions not observable in the single skin, thus indicating the intermediate character of the present form.

Melomys bougainville sp. nov.

Diagnosis.—A medium-sized, broadfooted, reddish species, allied to *M. rufescens* Alston of Duke of York Island, but differing in having a proportionately longer tail, and smaller nasals, palatal foramina, and molar row. Habitat: Bougainville Island.

Colour.—General colour of back bright yellowish red. According to Ridgway's "Standards" the centre of the back is a russet sayal brown owing to the pencilling of the darker hair-tips; clearer on the rump where the light tips are about cinnamon-rufous. Cheeks below eye, lower sides, and limbs washed with pinkish cinnamon, which is paler towards the extremities. Edges of lips, throat, inside of limbs, and entire undersurface strongly contrasting ivory or buffy white, the hair white to the base. Manus and pes creamy white, with a dark mark extending along the outside, covering half the back of the manus, and forming a narrow line on the pes from the outside of the heel to the base of the fourth digit.

External characters.—Limbs stout, manus large, with thick digits and strongly arched claws, and pes very broad. Ears short and rounded, when pressed forward barely reaching two-thirds of the distance to the posterior canthus of the eye, outer upper half and entire inside naked. Pollex rudimentary, with broadly arched nail entirely covering it above. Palm with combined thenar-interdigital pad inflated and triangular with a depression in hind margin, the surface microscopically striated; second to fourth interdigital pads inflated, rounded, and smooth, the outer with a small subsidiary postero-external pad, and the rearmost or hypothenar pad large and inflated. Sole with smooth globular interdigital pads, the first with a small outer subsidiary pad. Thenar pad 6 mm. long, smooth and broad and unusually close to the side of the pes; hypothenar pad not elongate but rounded, and separated by less than 1 mm. from the fourth interdigital pad. Tail naked except for average of one microscopic hair to each scale; the short fur at the base extending 1 cm. from the vent; scales extremely small, averaging 16 to the cm., but raised and inflated as in *M. rubicola* and *limicauda*, not set in defined rings but somewhat diagonally as figured for *Pogonomys forbesi*. Tail-tip curling upwards as in *Pogonomys* but not entirely naked above as in that genus, being surrounded for the final 25 mm. with a leathery replica of the scale-pattern, which is coarser above, indicating at least semi-prehensile use.

Palate ridges.—Seven; two pre-molar ridges, raised and undivided, and five inter-molar ones, the first and fifth not completely divided and the intermediate ones divided, the fourth being very incomplete.

Skull and dentition.—Compared with the holotype skull of *M. musavora* Ramsay = *rufescens* Alston, of similar length, it is distinguished by its narrower rostrum contrasted with a decidedly broader and more inflated cranial region, as emphasized by the zygomatic arches being wider posteriorly. Zygomatic plate lighter, almost transparent and narrower, its profile slanted obliquely under instead of boldly convex. Interorbital region somewhat broader, and the slight ridging expanded outwards in conformation with the wider cranium. Readily distinguished by the nasals, which are smaller and straighter sided, much less expanded anteriorly, and have markedly truncated instead of rounded tips. Palatal foramina much narrower. Molars decidedly lighter, the upper row being shorter and m^1 narrower than in *rufescens*, but the general pattern quite similar, and as in *cervinipes* of the mainland.

Dimensions of holotype male.—In spirit, dimensions in brackets from skin of type of Ramsay's *musavora*; head and body 149 (170*); tail 140 (97·5); pes 27·5 (28·5); ear 14·3 x 12 (15·5 x 10·2) mm.

Skull: Greatest length, to back of interparietal, 36·1 (36·5); basal length 31·9 (—); zygomatic breadth 20·1 (18·9); interorbital width 6·8 (6·3); nasals 12·4 x 3·6 (13 x 4·4); palatal length 18·2 (19); palatal foramina 4·8 x 2 (5 x 2·5); bulla length 4·2 (—); upper molar row 6·1 (6·6); width of m^1 1·9 (2·1) mm.

Specimens examined.—The holotype male, No. M. 5757, from the Buin district of Bougainville, in comparison with the lectotype male and allotype female of *Mus musavora* Ramsay = *Melomys rufescens* Alston, from Duke of York Island, Nos. M. 2367–8, collected by the Rev. George Brown about 1876, in the Australian Museum collection.

Remarks.—This well-defined species is nearest allied to *rufescens* in colouration and the smallness of the tail scales, but is differentiated by the marked cranial characteristics and definitely longer tail. The short and less tapered tail of *rufescens* has the small scales arranged in more definite rings, and doubtless lacks the up-curled more prehensile tip of *bougainville*. Actually the general appearance, and the manus and pes, with enlarged and rounded pads and stout, mobile strongly clawed digits, suggests a much more exclusively arboreal existence than that of the mainland *Melomys*. Associated with this, the tendency of the tail towards the condition found in *Pogonomys*, with the diagonal scaling, and up-curled though not entirely smooth tip above, is suggestive of an interesting intermediate prehensile development linking *Melomys* with the simpler-toothed forms of the more arboreal *Pogonomys*.

In his description Ramsay used the vernacular name "Banana Rat" for the Duke of York Island species, stating that it fed on the plantain, also that the body was rather heavily made, the limbs short and thick, and the feet rather long and broad. These features apply generally to the Bougainville specimen except that the hindfoot is relatively smaller and broader. The diet and habits are doubtless very similar, though more definitely arboreal, and it is known to the natives as "Ituoko," and as the "yellow rat" by its collector. A second adult male recently received from Father Poncelet has external dimensions conforming almost exactly with the holotype.

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* The head and body length is exaggerated by measurement of stuffed skin. Alston's type dimensions of head and body 127, tail 109 mm., support the conclusion that *rufescens* has a relatively smaller body and considerably shorter tail.

Solomys salebrosus sp. nov.

Diagnosis.—A robust coarse-coated and sombre yellowish brown species, with a profuse admixture of longer black hairs extending from forehead to rump. Distinguished from the nearest ally, *S. sapientis* of Ysabel Island, in addition to colour and pelage, by various cranial features, and the relatively heavier molars. Habitat: Bougainville Island.

Colour.—General colour of back grizzled dark yellowish brown, composed of the cinnamon-buff to sayal brown upper half of the fur, with a sprinkling of light buff tips and heavy pencilling of the longer jet black hairs. Sides becoming clearer cinnamon-buff, with the black hairs shorter and sparser, gradually merging into the paler almost pinkish-buff undersurface. Nose, lips, and backs of ears about snuff brown; head coarsely grizzled with light buffy, dark brown, and black hairs. Forearm washed with Prout's brown. Manus dark, between Prout's and mummy brown, speckled with light buffy hairs, most marked on the inner edge and fringing the digits. Pes of holotype male light, warm buff, with a Prout's brown tinge continued from the limb to form a dark line near the outer edge of the pes to the base of the second digit; pes of allotype female differing in being entirely dark, about snuff brown. Female otherwise differing but slightly, probably individually, in the various tones of the grizzling, with a slightly greater abundance of shining tips, some ochraceous tawny ones tending to form patches on the nape and shoulders. Undersurface paler, greyish buff.

External characters.—Texture of coat more sparse and coarse than in *S. sapientis*, the long pile especially coarser and more profuse and averaging 22 mm. in length. Palms and soles as in *sapientis*, the thenar pad very long (11 mm.) and close to the large triangular fourth interdigital pad. Tail averaging consistently, if slightly, shorter than head and body, whereas it may be equal, and up to 42 mm. longer, in *sapientis*; hair extending somewhat further onto base, 1¼ inches in all, remainder naked and similarly scaled, the rings 9–10 to the cm. Mammae 4.

Skull and dentition.—General appearance of skulls of male and female types much as in topotypic female of *sapientis*, the edges of the nasalia equally sinuous, but the interorbital region relatively broader and not so evenly concave, having expanded overhanging edges posteriorly. Zygomatic plate broader owing to not being so deeply arched behind, and the anterior profile varying from straight or almost concave in the female to slightly convex in the male. Palatal emargination barely extending beyond the middle of m^3 and therefore less marked than in *sapientis*. Palatal foramina shorter and definitely constricted in their anterior half, instead of evenly arched. Bullae proportionately smaller, and definitely less inflated in both sexes than in the slightly shorter topotype female skull of *sapientis*.

Pattern of molar rows quite as in the young adult female of *sapientis*, but longer and heavier, the condition being most emphasized in the lower row, which is 11–11·5 opposed to 10·1 mm. long, while m_2 is 3·3 against 3 mm. in width. Hind lamina of m_3 also distinctly wider.

Dimensions of holotype male.—In spirit: head and body 229; tail 213; pes 46; ear 18 × 14·5 mm.

Skull of female allotype: greatest length 52; basilar length 43·4; zygomatic breadth 29·2; interorbital width 8·7 (9 in male); nasals 18·3 × 5·6; palate length 27·5; palatal foramina 6·5 × 3 (6·2 × 2·9 in male); upper molars 10·9; width of m^1 3·2; lower molars 11; width of m_2 3·3 mm.

Specimens examined.—Six specimens, including male holotype No. M. 5590 and female allotype M. 5589, also a male and three female paratypes in the Australian Museum, collected on Bougainville by Rev. J. B. Poncelet, S.M. Compared with a female of *S. sapientis* from Ysabel Island, presented to the Australian Museum by Mr. N. S. Heffernan, when District Officer of that Island.

Remarks.—Though evidently allied to the Ysabel animal, this species is clearly distinguished by the colour and coarser pelage as well as the cranial features and apparently heavier molars. It is obviously distinguished from *Melomys porculus* of Guadalcanar by the generic feature of the much larger bullæ, described as minute in *porculus*, and the much longer tail.

In reference to the Ysabel animal Mr. N. S. Heffernan, then District Officer of the Island, wrote that it was a big and large-toothed rat which must be almost entirely arboreal, as it cracks the Ngali (*Canarium*) nuts and gnaws coconuts, and is found in trees felled by the natives, by whom it is eaten.

The skull is readily distinguished from that of *S. salamonis* described by Ramsay from Ugi Island, near San Christoval, at the south-eastern end of the group, by the decidedly narrow interorbital region, the margins of which are markedly sinuous instead of straight.

Unicomys ponceleti Troughton.

Unicomys ponceleti Troughton, Rec. Austr. Mus., xix, 4, 1935, pp. 259–262, pl. xix, figs. 1–8 (animal and skull).

The holotype adult young male and two paratype skulls formed the basis of the new genus and species, described in the preceding part of the Records, which may be thus briefly diagnosed. A uniformly blackish giant rat, with a remarkably long and sparse coat which is without underfur, and the basal three inches of the tail covered with hair of about the same length, the remainder of tail naked and file-like owing to the irregular rings of raised non-overlapping scales with crinkled surfaces. Differing from the nearest geographical ally, *Cyromys*, and *Mallomys* of Papua, in the hairy instead of woolly coat, relative size of pes and skull, and cranial and dental features described.

This striking form represents the outstanding novelty of the remarkably varied collection received from the Rev. J. B. Poncelet, who stated that it was very rare in the densely wooded country ten miles inland from Buin, on the southern coast of Bougainville, where it is called " Nagara " by the natives. Doubtless the prehensile adaptations of the hindfoot and tail have evolved owing to a mainly arboreal existence in the dense foliage of its habitat, during prolonged isolation similar to that of *Cyromys*, which produced an arboreal as well as terrestrial species of that genus on Guadalcanar Island.

It was indeed a pleasure to associate the name of the collector with this unique animal in appreciation of the important and careful field-work which he voluntarily undertook on behalf of the Australian Museum.

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Pteropus grandis Thomas.

Pteropus grandis Thomas, Ann. Mag. Nat. Hist. (5), xix, 1887, p. 147; *Id.*, Proc. Zool. Soc., 1887, p. 320, pl. xxv (animal), text fig. 1 (teeth). Alu, near Shortland Island.

An adult male, female, and young female of the species, not hitherto represented in the collection, are welcome additions from Bougainville, from which Island it was previously collected by A. S. Meek for the British Museum in 1908, and by the Whitney Expedition for the American Museum of Natural History in 1928–9.

Characters.—The specimens conform generally with Andersen's "Catalogue" review, with a tendency for the female to have a slightly darker back as remarked by Sanborn, though it is doubtful if this is not individual. It is notable, however, that the adult female's forearm length increases the listed range from 167–172 to 177 mm., while the ear dimension, estimated by Andersen at about 30 mm. from dried skins, can be given the definite range of 29·5–31·5 mm. in length and 17–19 mm. in breadth, from the above material in spirit; the foot (*c.u.*) 54–57 mm. reaches the maximum given. Cranial and dental dimensions are within the range listed, excepting that the female with the outsize forearm has the upper and lower canine to hind molar tooth rows measuring slightly below the minimum listed for males, with the premolars and molars correspondingly somewhat shorter and narrower.

Distribution.—Northern and east central Solomons; recorded from the islands of Bougainville, Mono, Choiseul, Ysabel, and doubtless known from Shortland, as the type locality of Alu is a small island close to it, though Thomas apparently regarded it as a locality on the larger island.

Pteralopex anceps K. Andersen.

Pteralopex anceps K. Andersen, Ann. Mag. Nat. Hist. (8) iii, 1909, p. 266: Bougainville Island.

No specimens of this representative of the essentially pteropine genus have been received as yet from Father Poncelet. It was not secured by the Crane or Whitney American Expeditions, and apparently no specimens have been recorded since A. S. Meek collected the immature female holotype for the British Museum in 1904.

According to Sanborn, a specimen of the allied species, *atrata*, previously known only from Guadalcanar, was shot on Ysabel at night while feeding upon green coconuts. It was said to be the only one of the wounded fruit-bats which showed fight and tried to attack the collectors, which is certainly surprising, as it is usually necessary to show caution when approaching wounded fruit-bats on the mainland, though they may not be the actual aggressors.

Dobsonia inermis nesea K. Andersen.

Dobsonia inermis K. Andersen, Ann. Mag. Nat. Hist. (8) iv, 1909, p. 532: Ugi Island, near San Christoval.

Dobsonia nesea K. Andersen, Ann. Mag. Nat. Hist. (8) iv, 1909, p. 532: Alu Island, near Shortland Island.

In his arrangement of the *D. viridis* section of the genus, Andersen considered that separate species were represented in the Solomons, *inermis* being from the south-eastern, and *nesea* the west and central areas. Examination of seven males

and seven females from Bougainville, together with a series of both sexes already in the collection from Ysabel, from which islands the genus had not been recorded previously, shows that there is but a single species occurring throughout the group. Comparison of a detailed series of cranial and external dimensions indicate considerable intergradation, but it would appear that two subspecific races may be retained. Of these, the typical race *D. inermis inermis* with a somewhat shorter ear and generally lighter coloration is from San Christoval and Ugi and Ysabel Islands in the south-eastern and east central area, and *D. inermis nesea* with the ear averaging longer and the colour somewhat darker and more olivaceous, is from Alu, Shortland, Bougainville and Rubiana Islands in the northern and west central areas of the Solomons.

Characters.—Concerning the specific characters used by Andersen, it is notable that in his catalogue synopsis the forearm length groups the two forms, while the Australian Museum series of twenty crania from various localities shows the main diagnostic feature regarding the more or less proclivous state of the premaxillæ and canines to be quite unstable. Noting that Andersen had only females of *inermis* and males of *nesea*, it was considered possible that a consistent sexual difference was indicated, until the cranial series showed a male and female from Ugi to possess the proclivous condition stated to be typical of the males of *nesea*, while two females from Bougainville present the more vertical and less proclivous anterior profile figured for the females of *inermis*. An extensive series of dental measurements show a tendency to insular variation, but there is a confusing amount of intergradation which negatives its diagnostic importance.

Distribution.—Northern and west-central Solomons; type locality, Alu Island, also from nearby Shortland and Bougainville Islands, and Rubiana Island.

Nyctimene bougainville sp. nov.

Diagnosis.—Closely allied to the typical species of the *papuanus* group but distinguished by the darker undersurface in both sexes, somewhat smaller ear and shorter tail, and distinctly longer and narrower p_3 and p_4. Differing from its congener of the Solomons, *N. scitulus*, by its much smaller forearm and other dimensions, as well as in colour, and length and closeness of coat. Foreman 55–59·5 mm. Habitat: Bougainville Island.

Colour.—Male: Back hair-brown with a warmer tinge of wood brown, and a slightly rippled effect caused by the lighter drabby and darker brown tips of the wavy hairs; fur edging membranes, on lower half of forearm, and knee, cinnamon to Prout's brown. Nape paler owing to emphasis of drab-gray tipping, and head a clearer hair brown than back, neither part being darker than the back as in *papuanus*. Undersurface, though lighter than back, not whitish and sharply contrasted in centre like *papuanus*; general colour below pale hair to drabby brown, washed with dark olive-buff on centre of chest and belly, the hairs on each side being a drabby brown to their bases.

Female: Above, paler more avellaneous brown, with edging of membrane, and fur on forearm a lighter brown. Head paler drabby brown. Undersurface clearer hair brown, washed with avellaneous, not yellowish-white in the centre, the hairs being buffy-brown to their bases. The dorsal stripe in both sexes rather short, being very poorly defined in the region of the shoulders and foreback.

External and dental characters.—Pelage closer and shorter and dimensions much smaller than in *N. scitulus*, the ear somewhat smaller and the tail shorter than in *papuanus*. Lower pm_3 and pm_4 definitely longer and narrower than the maximum given for those teeth of *papuanus*, the greater length especially marked in pm_3.

Dimensions of holotype male.—In spirit: Forearm 59; tibia 21; tail 22·5; pes 14·5; ear 13 x 9·5 mm.

Skull: Length, lambda to gnathion, 31·1; palation to incisive foramina 13; width of braincase at zygomata 12·8; zygomatic width 20; width outside m_1, 8·6; interorbital width 6·2; postorbital width 5·9; orbital diameter 8·6; upper teeth, $c–m^1$, 10·5; lower teeth, $c–m_2$, 11·9; pm_3, 2·7 x 1·4 mm.

Specimens examined.—Series of twelve including eight males and four males, the male holotype registered No. M.5787 and the allotype M.5785 in the Australian Museum collection.

Remarks.—The series is of interest in providing the first record of the genus from Bougainville, as well as in extending the range of the short-forearmed *papuanus* group into the Solomons, where the new form represents the second known species. The native name of Mutukenu is given by the collector, and for one specimen Numekomu.

Odontonycteris lagochilus microtus K. Andersen.

Macroglossus lagochilus microtus K. Andersen, Ann. Mag. Nat. Hist. (8), vii, 1911, p. 642: Guadalcanar.

Two males from Bougainville provide the first record of the genus north of Guadalcanar in the Solomons, though it is of course evident that the geographical race may be widely distributed within the group. In addition to the original specimens from Guadalcanar and Florida, two were recorded from San Christoval by Sanborn in 1931. In view of the slender nature of the characters separating the races of the Bismarck Archipelago and Solomons, the slight variation shown by the Bougainville specimens is not marked enough to indicate the presence of a northwestern race in the Solomons. The native name "Mutukenu" is associated with this animal on Bougainville, as well as with *Nyctimene*, and also the name "Numekomu."

Hipposideros diadema oceanitis K. Andersen.

Hipposideros diadema oceanitis K. Andersen, Ann. Mag. Nat. Hist. (7) xvi, 1905, p. 497: Guadalcanar.

This subspecies, originally listed from Guadalcanar and Fauro by Andersen, is not yet represented in the Poncelet collection but was recorded from Bougainville by Sanborn in 1931, who also records it from Ysabel and Vella Lavella Islands.

Hipposideros cervinus Gould.

Rhinolophus ? cervinus Gould, Mamm. Austr., pt. vi, vol. iii, pl. xxxiv: Cape York and Albany Island, North Queensland.

A fine series of twenty males and sixteen females provide not only the first note of the species occurrence on Bougainville but also apparently the first record from the Solomons since Thomas originally listed the specimens collected on Fauro Island by the late C. M. Woodford in 1887.

Several specimens are in the Museum from Ysabel which were part of the splendid collections received from Mr. N. S. Heffernan when District Officer there, providing a new record for that island. As this very widely distributed small species probably occurs on most islands of the group, it is surprising that no specimens were taken in the Solomons by the recent American expeditions, though several New Hebridean and one Santa Cruz localities are listed in Sanborn's account.

Five native names are given for this species, of which four—Bogungakau, Luliganu, Malekenu, and Mimekomu—are not listed for other bats, while Numekomu is also given for one specimen of *Nyctimene* which, of course, is of strikingly different appearance.

Anthops ornatus Thomas.

Anthops ornatus Thomas, Ann. Mag. Nat. Hist., (6) i, 1888, p. 156; *Id.*, Proc. Zool. Soc., 1888, p. 477, pl. xxii, fig. 1 (noseleaf); Guadalcanar.

A female provides the first record of this remarkable and rare species from Bougainville, indicating that the range throughout the group is far more comprehensive than might have been supposed. It is apparently only the second specimen recorded as being taken since the original series was described from Guadalcanar. The intervening specimen was listed by Sanborn in 1931 as being taken at Choiseul by the Whitney Expedition in 1929. A male collected at Ysabel for the Australian Museum by Mr. N. S. Heffernan in 1924, represents a new record for the island as well as an important link in the distribution of the sole member of a genus characterized by the extraordinary arrangement of the facial membranes, rudimentary nature of the tail, and various other features involving its genetic relationship in considerable doubt.

The forearm range of the six specimens of the typical series was given as from 48–53 mm., of which the largest was a male. The forearm length of the male from Ysabel is 47 mm., while that of the female from Bougainville is 52·5 mm. The name "Kengki" is listed by the collector as being applied to this species only by the natives of Bougainville.

Pipistrellus ponceleti sp. nov.

Diagnosis.—A medium-sized chocolate brown representative of the *papuanus* group of pipistrels, with a forearm range of 32–33·8 mm., and a skull-length of 12–12·4 mm. in the adult male and female types. Distinguished from the typical form of *papuanus* by the longer tibia and foot, and from the geographically intermediate *angulatus* of the Bismarck Archipelago, which is of generally similar dimensions, by the definitely shorter and relatively broader ear, and shorter tragus. Habitat: Bougainville and other islands of the Solomons group.

Colour.—General colour, light to medium chocolate brown, much as in *Chalinolobus morio*, brighter in the female, the head and neck uniform with the back in both sexes. Above the male is a dusky shade of Prout's brown (Ridgway), and the generally lighter female cinnamon-brown. Below, the general colour of both sexes is not strongly contrasted, though lighter than the back, especially in the female which has the ventral fur tipped with Brussels brown, instead of the Saccardo's umber or light mummy brown of the male.

External Characters.—Forearm of medium range and the tibia and foot longer than in typical *papuanus*. Ear relatively short and broad, obtusely rounded at the tip and boldly convex in the inner and outer lower halves, tending to accentuate an outer emargination below the tip which is lacking in the nearest allies; the ear is definitely smaller and the tragus shorter and more arched than in *P. angulatus*. Calcaneal lobe relatively long and narrow, about 4 × 1 mm.

Skull and dentition.—Skull of medium size and relatively slender. Teeth rather small, the maxillary row measuring 4·3 mm. Upper first premolar crowded forward internally so that its apex is almost hidden laterally by the rear cusp or talon of the canine; lower first premolar almost of the same bulk basally as, and usually at least two-thirds the height of, the 2nd lower premolar.

Dimensions of holotype male.—In spirit: forearm 33·5; 3rd digit, metacarpal 31·8; head and body 42; tail 35; tibia 13·5; pes 7·5 (*c.u.*); ear, from outer base 11·5, from inner base 8·6, width 8·3 mm.

Skull: greatest length 12·4; breadth of braincase 6·3; palato-sinual length 4·6; maxillary tooth-row 4·4; pm^4–m^3 3mm.

Specimens examined.—Six specimens from Bougainville, including the holotype No. M.5798 and allotype M.5599 in the Australian Museum, collected by the Rev. J. B. Poncelet, S.M. A specimen from Ysabel collected and presented by Mr. N. S. Heffernan when District Officer there, and three from Ugi Island, adjacent to San Christoval, apparently provide the first records of pipistrels from those islands, which agree well with the typical series. A spirit specimen from New Ireland, received from the Rev. George Brown about 1876, which may be taken as topotypical of *P. angulatus* of Peters, was of assistance in indicating the differences of ear and tragus in the intermdiate Bismarck Archipelago form.

Remarks.—First recorded as *Vesperugo abramus* Temminck from Guadalcanar by Thomas in 1888, no specimens appear to have been listed since, and apparently none were secured by the recent American expeditions within the Solomons. Since the original identification, however, the unreasonably extensive range accorded to *abramus* has been reduced by the recognition of individual species from New Guinea and adjacent islands, and there seems no doubt that the animal from the Solomons is separable as a distinct form. It is distinguished from *abramus* by the generally smaller dimensions and uniform colouring of the dorsal surface, from *papuanus papuanus* by the longer tibia and foot, from *papuanus collinus* by the smaller forearm and size, and from *angulatus* by the smaller ear and shorter tragus.

The uniformly mid-brown species was listed as the "little brown bat" by its collector, whose name is gladly associated with this most distant form of the world genus in further appreciation of his efforts which have yielded such valuable and varied material for research. The native name "Tsilamai," also applied to *Emballonura solomonis*, was listed for the species, and the word "Tereka" was also associated with one specimen.

Emballonura solomonis Thomas.

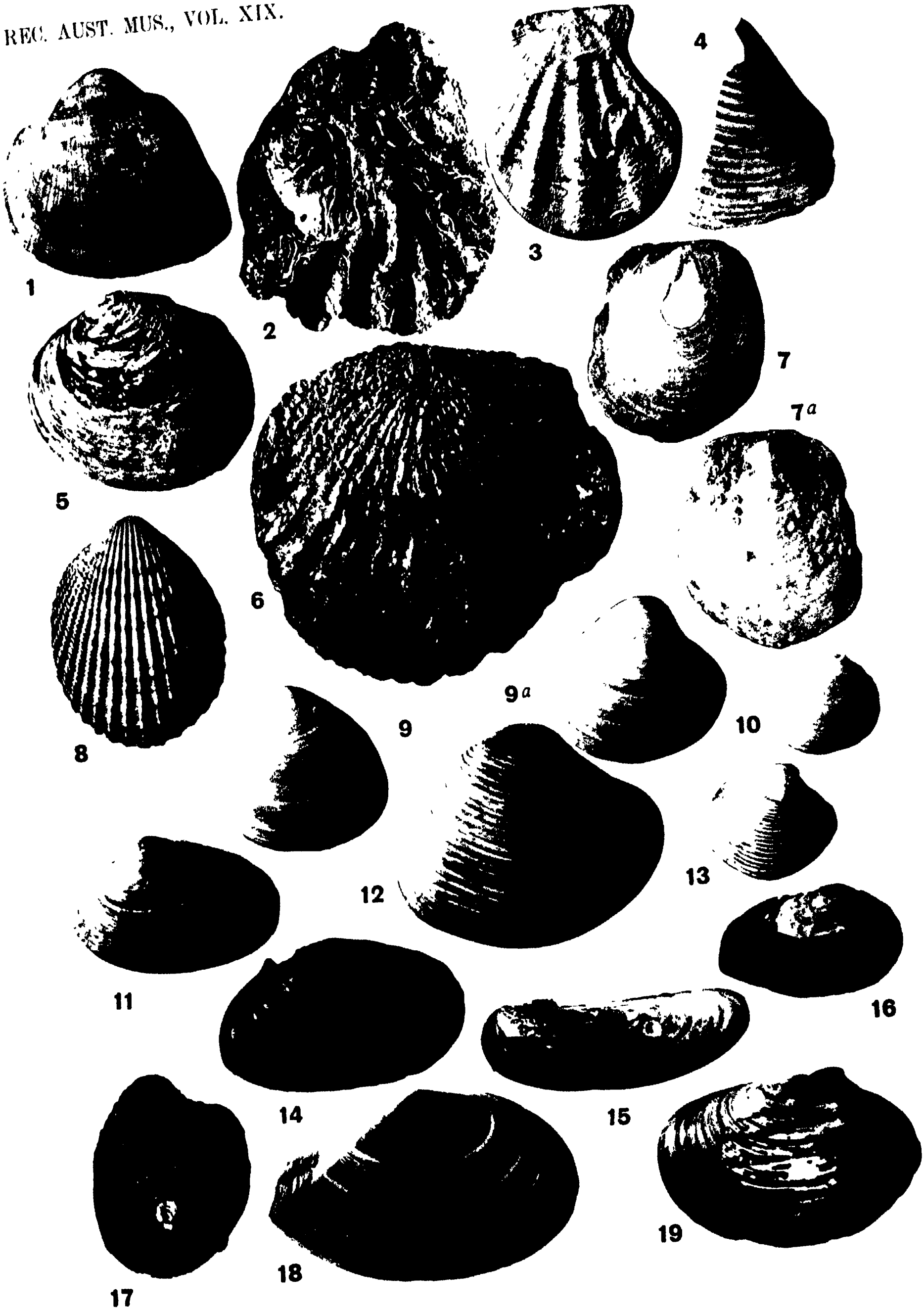
Emballonura nigrescens solomonis Thomas, Ann. Mag. Nat. Hist. (7) xiv, 1904, p. 200: Florida Island, Solomons.

Seven specimens, with a forearm maximum of 36 mm. in males and 38·3 in females, provide the first record of the species from Bougainville, while several specimens from Guadalcanar, received from Mr. C. E. Hart in 1924, supply the first

record for that island. It was originally recorded as *E. nigrescens* from Fauro, Shortland, Savo, and Ugi in 1887 by Thomas, who stated that it seemed to be very common in the Solomons, as both Surgeon Guppy and C. M. Woodford had obtained considerable numbers. It is listed in addition by Sanborn (1931) as *E. nigricans solomonis* from San Christoval, Bauro, Pavuvu and Vella Lavella, but in 1914 Thomas accorded the form specific rank with a range extending to the Admiralty group. Stating that, as often happens, the Solomons form is quite like that of the Bismarck Archipelago while the New Guinea ones are distinct, Thomas described *E. papuana* from Dutch New Guinea and restricted the range of *E. nigrescens* to the islands of Amboina and Buru.

The much paler coloration, which is of a dusky instead of rich Mars brown, and the long tragus distinguish *solomonis* from the other species in the group, which was described as *E. cor* from Choiseul Island by Thomas in 1915. The present specimens were listed as the " Little white bat " by Father Poncelet owing to the pale base of the sparse fur and glimpses of skin giving a whitish appearance to the small creatures. As with the preceding species, the native names of Tsilamai and Tereka were listed as being associated with *E. solomonis* on Bougainville.

Sydney: Alfred James Kent, I.S.O., Government Printer—1936.



G. C. CLUTTON, photo.

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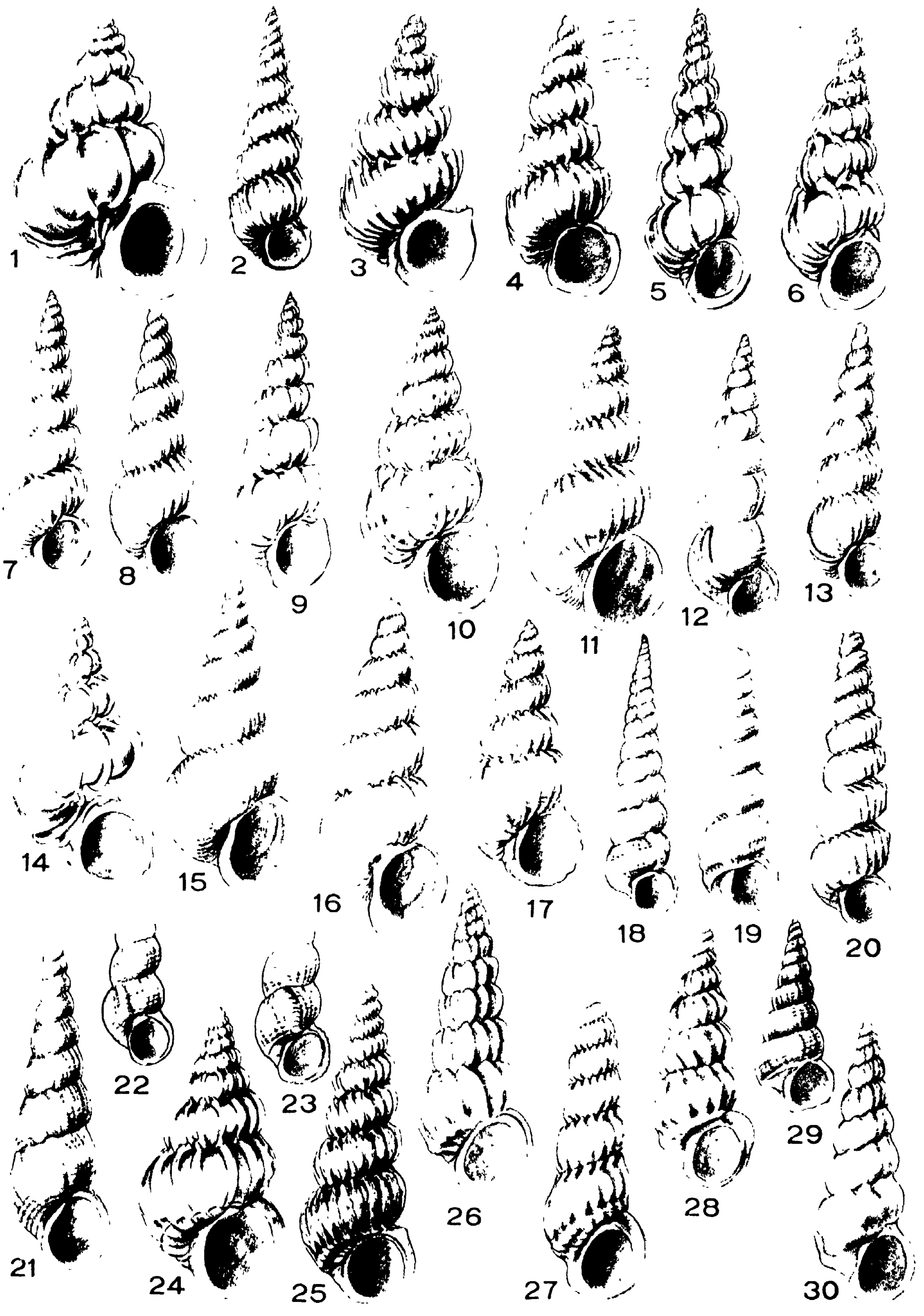

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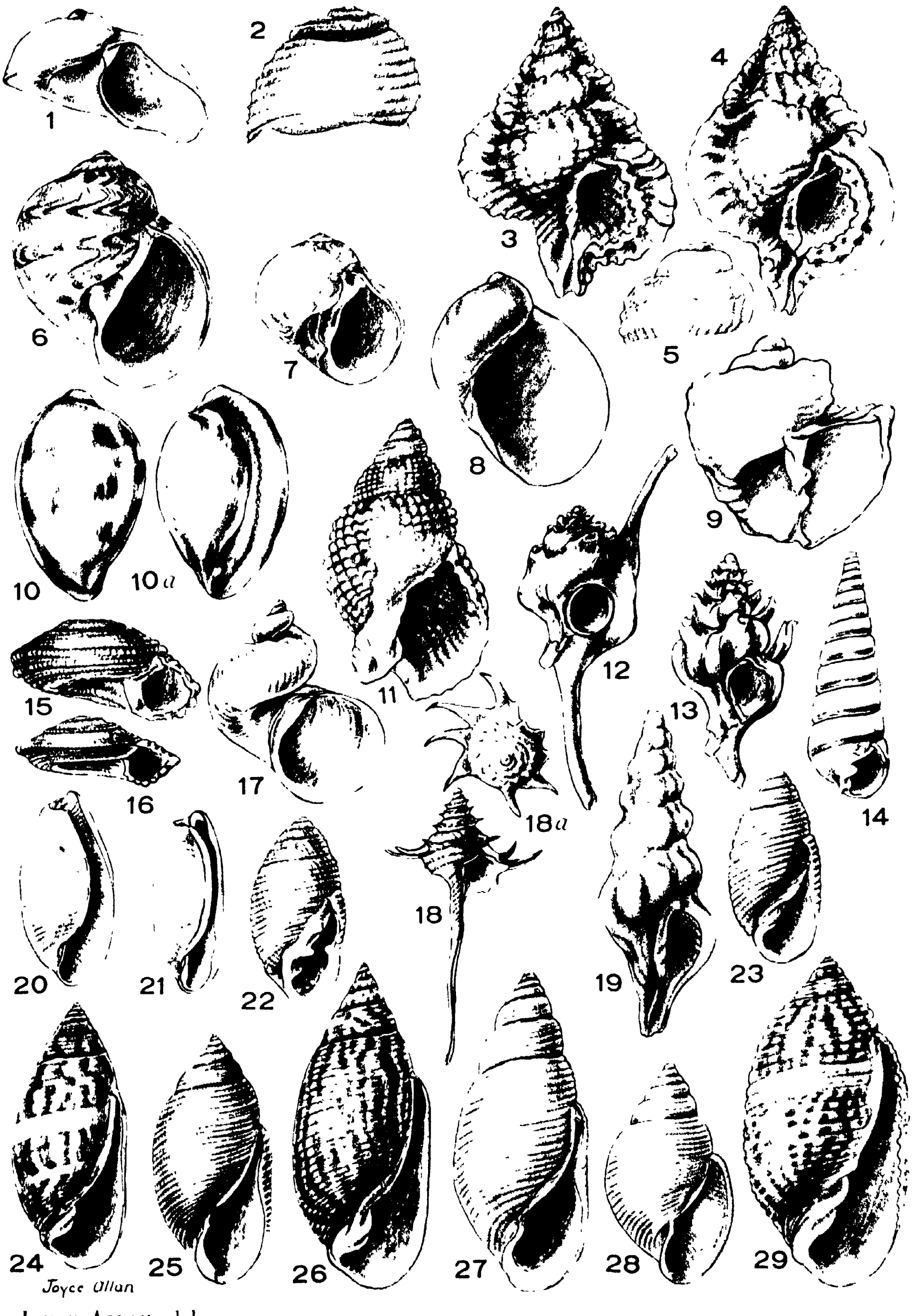

JOYCE ALLAN, del.

STUDIES ON RECENT PETRALIIDAE (BRYOZOA).

By

LEO W. STACH, B.Sc.,

(MacBain Research Scholar in Zoology, University of Melbourne).

(Figures 1–19.)

INTRODUCTION.

Tropical and sub-tropical Petraliidae have, within the last decade, assumed considerable prominence. Several authors[1] have remarked upon the unsatisfactory grouping of the species and the lack of accommodation for recently described forms.

To obtain satisfactory characters for subdivision, a study of the skeletal morphology of selected members of this group was undertaken. The author is chiefly indebted to the authorities of the Australian Museum, National Museum (Melbourne), South Australian Museum and United States National Museum for loan and exchange of relevant material, and to Mr. A. A. Livingstone (Assistant Zoologist, Australian Museum), for many helpful suggestions.

For the study of the skeletal morphology, dry specimens were incinerated over a gas flame and fragments were mounted in various positions, dissections being then carried out with the aid of fine needles to display the frontal, lateral and distal walls, the basal lamina and the structures pertaining to radicular insertion. It was found necessary to draw the preparations within the next two or three days, since they began to deteriorate if left much longer.

Family **PETRALIIDAE** Levinsen, 1909.

Petraliidae Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 350.

Petraliidae Levinsen, Canu and Bassler, U.S. Nat. Museum, Bull. 100, ix, 1929, p. 250.

Observations.—The author would restrict Petraliidae to include only those species which have a finely-perforated hyperstomial ovicell opening above the normal plane of the zooecial aperture, whose zoarium has some form of radicular attachment, and whose zooecia have an aperture with a pair of cardelles situated close to the proximal rim.

Ecology.

The unilaminate zoaria of all Petraliidae live in situations distinct from those of completely encrusting forms, since their radicles permit attachment to insecure and irregular substrata upon which completely encrusting species could not develop. Hundreds of the brilliant vermilion zoaria of *Mucropetraliella ellerii* (Macgillivray, 1869) have been observed on the reef at Point Leo, Shoreham (Western Port, Vic.), growing over masses of coralline algae or loosely adherent to calcareous sponges,

[1] Hastings.—Sci. Repts. Grt. Barrier Reef Exped. (1928 29). Polyzoa, iv, 12. 1932. p. 435. Levinsen.—Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 351. Livingstone.—Vidensk. Medd. fra Dansk Naturh. Foren., lxxxvii, 1929 p. 76.

ascidians and the under surface of boulders. The potentiality for development of radicles thus allows a wide choice of substrata and explains their abundance in littoral, shallow and deeper water, as recorded by Canu and Bassler[2]. In the case of *Petralia livingstonei*, the radicles intertwine and agglutinate to form a filament used as an anchor on a sandy sea bottom, and this type of radicle development restricts the species to deeper water sandy bottoms, where currents probably exert some influence, as shown by its occurrence in numerous dredgings between 25 and 46 fathoms off the New South Wales Coast.[3] Canu and Bassler[4] have indicated the relationships of several species of this group to their substrata.

Distribution.

Probable ancestors of this group are to be found in the Lutetian (Middle Eocene) of France in the species described as *Petralia mucronata*, *P. convexa* and *P. immersa*, by Canu[5], and in the Jacksonian (Upper Eocene) of North America in such forms as *Hippomenella radicata* Canu and Bassler and *H. alifera* Canu and Bassler[6]. In the Lower Miocene of Victoria true Petraliids occur, while *Petraliella bisinuata* (Smitt) and *P. bisinuata grandis* Canu and Bassler have been recorded from the Pliocene of Panama.[7]

In recent times, Petraliidae has become predominantly an Indo-Pacific group, its distribution closely following that of the warm ocean currents, and, except for its extension into the Gulf of Mexico, it has not yet been found in the Atlantic region. The absence of Petraliidae from the west coast of America is probably due to the proximity of the Chili and California cold currents.

Mucropetraliella, though very prolific in species in the tropics, extends north to Japan[8] and Korea[9], where it is represented by *M. armata* (Waters) and *M. aviculifera* (Marcus, 1923, *non* Hincks, 1891), respectively, and south to Bass Strait and New Zealand waters. The type genus, which probably represents a local developmental trend, is confined to south-eastern Australia from northern New South Wales to South Australia. An isolated occurrence is that of "*Petralia*" *soulieri* (Calvet, 1902) in the Mediterranean.

Radicles.

The radicles are developed by budding from the basal body wall, the resulting radicle bud becoming separated from the zooecium proper by a calcareous plate pierced by uniporous or multiporous septula. The radicle rudiments do not all necessarily develop, but are potentially functional and capable of great variation, even within the same species, depending on the substratum to which the radicle is to be adapted. Thus the length is very variable and also the attachment area varies in its extent and degree of ramification.

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[2] Canu and Bassler.—Proc. U.S. Nat. Museum, lxxii, art. 14, 1928, pp. 78–82. Canu and Bassler.—U.S. Nat. Museum, Bull. 100, ix, 1929, pp. 255–266.
[3] Livingstone.—Rec. Austr. Museum, xv, 2, 1926, p. 169.
[4] Canu and Bassler.—Proc. U.S. Nat. Museum, lxxii, art. 14, 1928, pp. 78–82. Canu and Bassler.—U.S. Nat. Museum, Bull. 100, ix, 1929, pp. 255–266.
[5] Canu.—Bull. Soc. Geol. France, 4, xiii, 1914, pp. 301, 302.
[6] Canu and Bassler.—U.S. Nat. Museum, Bull. 106, 1920, pp. 386, 387.
[7] Canu and Bassler.—Proc. U.S. Nat. Museum, lxxii, art. 14, 1928, p. 13.
[8] Okada.—Sci. Repts. Tokyo Bunrika Daigaku, ii, 26, 1934, p. 14.
[9] Marcus.—Abh. Senck. Naturf. Ges., xxxv, 1923, p. 441.

In all Petraliidae, except *Petralia* (*sensu stricto*), where they adhere and intertwine to form an anchoring filament, the radicles remain single and are individually attached to their substratum.

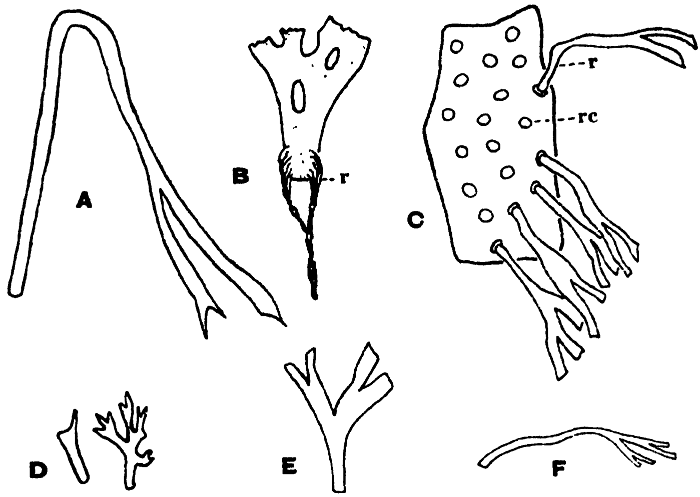


Figure 1.

Form of radicles from various species of Petrallidae. A. *Mucropetraliella* (*Poripetraliella*) *tuberosa*. × 30. B. *Petralia livingstonei*. A colony showing the coalescence of radicles to produce the attaching filament. × ⅜. C. *Petralia livingstonei*. Basal lamina of a single zooecium from edge of the proximal region of a zoarium, showing origin and form of radicles. × 30. D. *Hippopetraliella* (*Serripetraliella*) *chuakensis hastingsae*. × 30. E. *Mucropetraliella vultur*. × 30. F. *Mucropetraliella ellerii*. × 30. r, radicle; rc, radicular chambers.

Skeletal Morphology.

Aperture.—The fundamental apertural type is regarded as being subcircular, with a pair of cardelles developed on the lateral margins close to the proximal rim. From this central type, various modifications are developed.

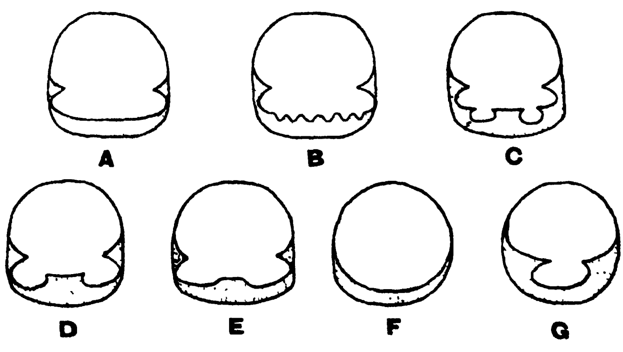


Figure 2.

Diagrammatic representation of the forms of aperture in Petraliidae. A. *Hippopetraliella*. B. *Hippopetraliella* (*Serripetraliella*). C. *Petraliella*. D. *Mucropetraliella*. E. *Petralia livingstonei*. F. *Petralia undata*. G. *Sinupetraliella*.

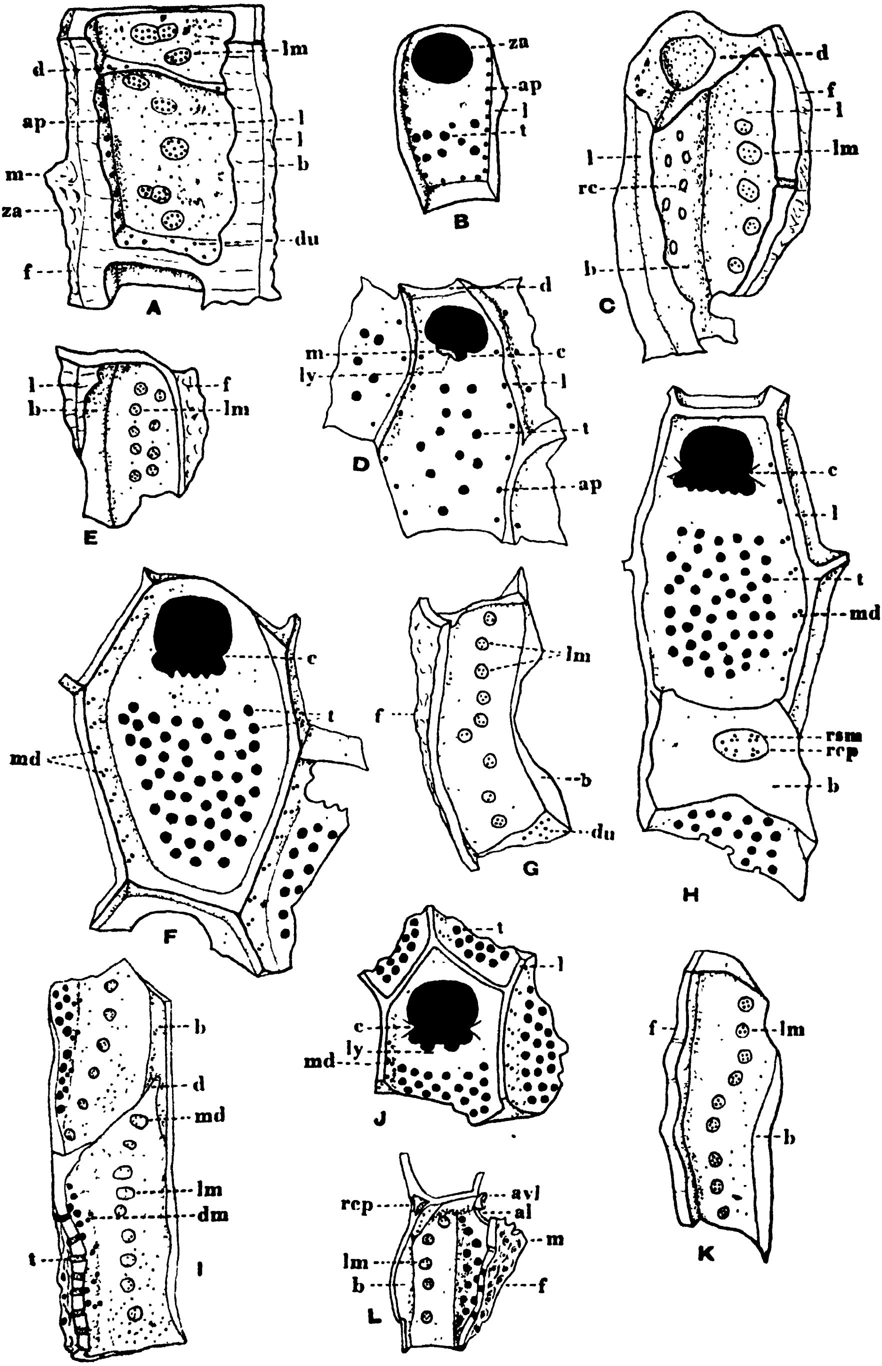


Figure 3—For Notes see page 359.

The simplest type, represented by *Hippopetraliella dorsiporosa* (Busk) has well-developed cardelles and a slightly concave and entire proximal rim bounded by a smooth, flat, narrow transverse plate. The suboral plate then becomes sinuate, as in *Hippopetraliella* (*Serripetraliella*) *chuakensis* (Waters), which has about four sinuses. From this develops the state seen in *Petraliella* (*sensu stricto*), where only two well-developed sinuses occur in the suboral plate.

The lyrule is then formed by the elimination of the outer bounding denticles of the two sinuses of the previous stage, giving the structure typical of *Mucropetraliella*. In *Petralia livingstonei*, sp. nov., the cardelles and lyrule become weaker, and finally disappear altogether in *Petralia undata* Macgillivray, which has a simple circular aperture. In *Sinupetraliella* the lyrule alone has disappeared and the cardelles here extend lower down on the proximal rim to form a broad sinus, limited by the cardelles. In *Petralia*, *Mucropetraliella* and *Sinupetraliella* a mucro bearing an avicularium partly projects over the aperture, and is probably protective in function.

The order of description of the above stages does not necessarily represent the developmental trend of apertural structures in this group. In the genus *Petralia* (*sensu stricto*), which is here regarded as the most recent development of this group, it is suggested that the trend has culminated, in the genotype, in the loss of cardelles and lyrule.

Frontal.—The frontal is a tremocyst supported by an inseparable olocyst, both being perforated by several or numerous tremopores. The margins are areolated to a greater or less degree. In older zooecia, additional calcareous deposition by the ectocyst may tend to close the tremopores and ornament the surface with irregular tuberosities. In *Petralia* and *Mucropetraliella* the tremopores are less numerous and less regular than in *Hippopetraliella* and *Petraliella*, where they form a close pattern on the frontal, surrounded by polygonal ridges.

The frontal supports avicularia in very varied positions. They may be placed longitudinally to one side below the aperture (*Hippopetraliella* (*Serripetraliella*) *marginata*) or alongside it (*Petraliella bisinuata*), flanking the distal margins of the aperture (*Petraliella arafurensis*) or occupying portion of the lateral margins (*Hippopetraliella dorsiporosa*). In some species of *Mucropetraliella* they occupy almost any position on the frontal. In *Mucropetraliella laccadivensis* (Robertson), small avicularia are often situated at the tips of erect processes which may occur at any position on the frontal[10].

Figure 3.

(Magnification × 25.)

Dissections of various species to show lateral walls and associated structures. A, B. *Petralia undata*, showing numerous pores of multiporous septula of lateral wall and the single submarginal series of areolar pores. C, D. *Petralia livingstonei*. E. *Hippopetraliella dorsiporosa*, showing double row of multiporous septula in lateral wall. F, G. *Hippopetraliella* (*Serripetraliella*) *chuakensis hastingsae*, showing numerous multiporous septula in a single series along the lateral wall and the submarginal series of paired septula communicating with the lateral dietella. H, I. *Hippopetraliella* (*Serripetraliella*) *marginata*. J, K. *Petraliella bisinuata*, showing submarginal series of paired septula communicating with the lateral dietella. L. *Mucropetraliella ellerii*. al, lateral rim of aperture; ap, areolar pores; avl, lateral avicularium; b, basal lamina; c, cardelle; d, distal wall; du, uniporous septula of distal wall; f, frontal; l, lateral wall; lm, multiporous septula of lateral wall; ly, lyrule; m, suboral mucro; md, pores of marginal dietella; rc, radicular chamber; rcp, primary radicular chamber; rsm, multiporous septula of radicular chambers; t, tremopore; za, aperture of zooecium.

[10]Robertson.—Rec. Indian Museum, xxii, 1, 1921, p. 56.

In *Mucropetraliella, Sinupetraliella* and *Petralia,* a suboral mucro supporting an avicularium is developed, varying greatly in size from the low prominence seen in *Petralia undata* to the tremendous globular mucro of *Mucropetraliella* (*Poripetraliella*) *tuberosa* (Busk). In these genera a small avicularium may occur on each lateral margin of the aperture, while the distal margin may develop four to eight spines. The avicularian chambers, in all the observed cases, communicate with the zooecia by uniporous septula.

Lateral Walls.—In all species examined, the zooecia communicate laterally by multiporous septula. The number of septula in each species is fairly constant, but the number of pores in each septulum varies greatly, the range in *Petralia undata* being from three to eleven.

Along the frontal edge of the lateral walls in *Petraliella* and *Hippopetraliella* a narrow dietella may be developed which communicates with the adjacent zooecia by a series of paired septula, varying in number from about eight to twelve. In *Petralia,* along the junction of the lateral walls and frontal, a regular series of single pores communicates with the areolae.

Distal Wall.—Scattered uniporous septula occur in *Petralia undata* and *Hippopetraliella chuakensis hastingsae,* and a varying number of multiporous septula in *Hippopetraliella dorsiporosa* and *Petraliella bisinuata.* In *Mucropetraliella,* a distal crescentic dietella with about ten uniporous septula is developed towards the basal side partly surrounding the primary radicular chamber.

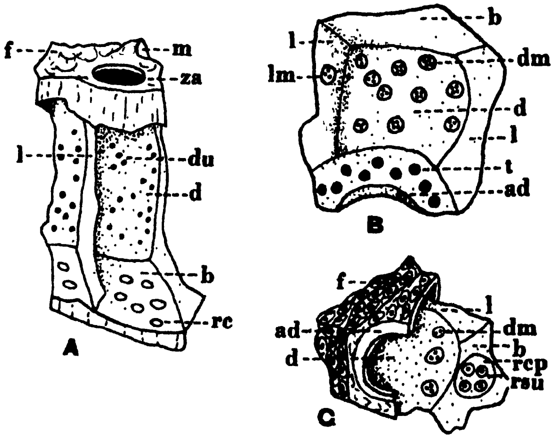


Figure 4.

(Magnification × 30.)

Dissections of various species to show the distal wall and associated structures. A. *Petralia undata,* showing numerous uniporous septula of distal wall. B. *Hippopetraliella dorsiporosa,* showing multiporous septula of distal wall. C. *Petraliella bisinuata.* ad, distal rim of aperture; b, basal lamina; d, distal wall; dm, multiporous septula of distal wall; du, uniporous septula of distal wall; f, frontal; l, lateral wall; lm, multiporous septula of lateral wall; m, suboral mucro; rc, radicular chambers; rcp, primary radicular chamber; rsu, uniporous septula of radicular chamber; t, tremopore; za, aperture of zooecium.

Basal lamina.—In all groups, except *Petralia* and *Poripetraliella*, the basal lamina is very thin, slightly convex, and crossed transversely by slight undulations and striations. In *Petralia* and *Poripetraliella* the basal lamina is much thickened by additional calcareous deposition, and the numerous radicular septula are situated at the base of deep pits, the margins of which are in high relief.

Radicular insertion.—The radicles are inserted into more or less distinct chambers which, in many cases, are partly roofed by calcareous deposition, as is well seen in transparent dry specimens of *Petraliella bisinuata*. In other cases, the radicular plate begins at a short distance below the basal level of the distal wall of the zooecium and slopes proximally to the level of the basal lamina. The small accessory radicular chambers are usually surrounded by a slight ridge in the basal lamina.

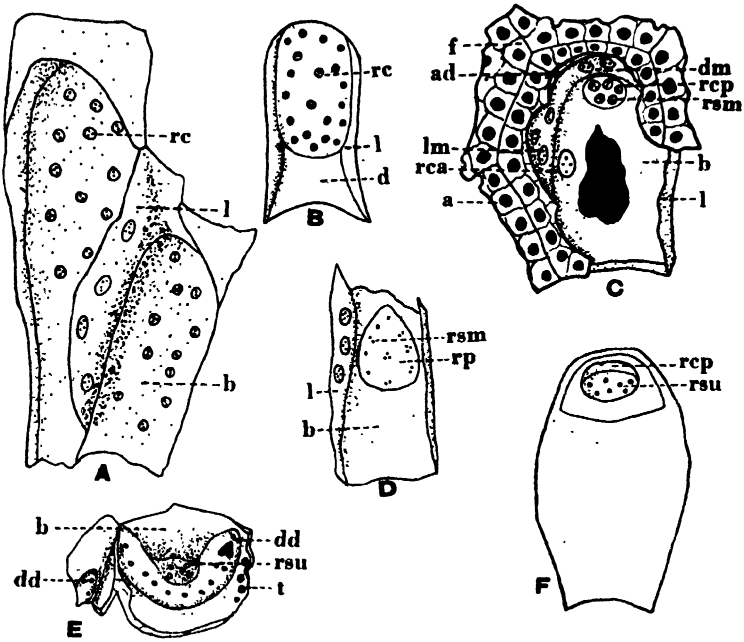


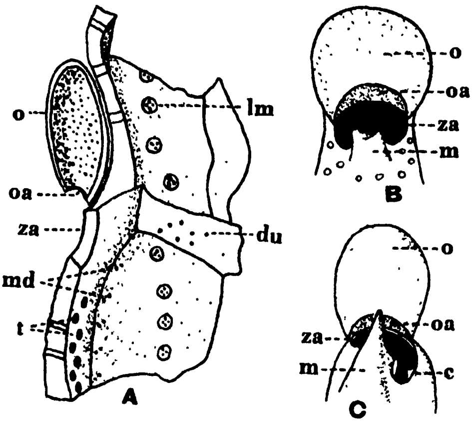
Figure 5.

(Magnification × 30.)

Dissections of various species illustrating radicular insertion and associated structures. A. *Petralia livingstonei*, showing the numerous small radicular chambers, with few uniporous radicular septula, covering the whole of the basal lamina. B. *Petralia undata*, showing radicular chambers occupying only the distal two-thirds of the basal lamina. C. *Hippopetraliella dorsiporosa*, showing primary radicular chamber with multiporous septula and accessory radicular chamber with uniporous septula. D. *Hippopetraliella* (*Serripetraliella*) *marginata*, showing large primary radicular chamber with multiporous septula. E. *Mucropetraliella ellerii*, showing primary radicular chamber partly surrounded by distal crescentic dietella perforated by uniporous septula. F. *Petraliella bisinuata*, showing a well-developed roof restricting the opening to the primary radicular chamber. a, areolae; ad, distal rim of aperture; b, basal lamina; d, distal wall; dd, distal crescentic dietella; dm, multiporous septula of distal wall; f, frontal; l, lateral wall; lm, multiporous septula of lateral wall; rc, radicular chambers; rca, accessory radicular chamber; rcp, primary radicular chamber; rp, radicular plate; rsm, multiporous septula of radicular chamber; rsu, uniporous septula of radicular chamber; t, tremopore.

In all cases where there is a single radicular chamber, it is situated at the distal end of the zooecium, while if several are present there is generally a single larger (primary) radicular chamber situated distally, with the smaller (accessory) chambers scattered within the latero distal margins. The radicular plate may be pierced either by numerous scattered uniporous septula or by multiporous septula, but this character perhaps depends on the greater or less area of the radicular chamber which may occupy a very small area at the distal end or may extend over practically the whole of the basal lamina in the same zoarium, as in *Hippopetraliella dorsiporosa*.

The primary radicular chamber, with or without accessory chambers, occurs in *Petraliella, Hippopetraliella, Mucropetraliella* and *Sinupetraliella*, and appears to be the primitive type, since the Eocene forms of Europe and America have a single distal radicular plate. The addition of the accessory chambers is a more recent development.



(Figure 6.)
(Magnification × 30.)

A. *Hippopetraliella* (*Serripetraliella*) *chuakensis hastingsae*, dissected to show aperture of ovicell opening above plane of aperture of the zooecium. B. *Mucropetraliella vultur*, showing ovicell. C. *Mucropetraliella ligulata*, showing ovicell. c, cardelle; du, uniporous septula of distal wall; lm, multiporous septula of laterall wall; m, suboral mucro; md, pores of marginal dietella; o, ovicell; oa, aperture of ovicell; t, tremopore; za, aperture of zooecium.

Poripetraliella represents an extension of the trend towards the development of accessory radicular chambers, for its radicular apparatus consists of a large primary radicular chamber with multiporous septula and numerous small radicular septula scattered over the basal lamina. In *Poripetraliella* the distal chambers bear radicles, but it is uncertain whether the accessory chambers, with three to four septula, are also functional. *Poripetraliella* forms a link between *Mucropetraliella* and *Petralia*.

In the latter, the radicular apparatus is confined solely to numerous small radicular septula, of which only those at the base of the zoarium have been observed to produce radicles.

The ovicell. The most constant feature of this group is the very finely and closely perforate ovicell which develops on the distal zooecium, scarcely causing

any depression on its frontal. It is hyperstomial and has a crescentic aperture opening above the plane of the zooecial aperture. The only variation of the ovicell noted in the observed species and in those of which they are described is in the size and degree of convexity.

Tabulation of Structure in Species Dissected.

Species.	Cardelles.	Lyrule.	Radicular Chambers.	Suboral Mucro.	Lateral Septula.	Lateral Dietellae	Distal Wall.
Undata ..	Absent ...	Absent	Numerous radicular septula (2–4).	Present ...	6 multiporous (3–11).	Single areolar pores.	About 20 uniporous.
Livingstonei.	Well developed.	Weak	Numerous radicular septula (2–4)	Present ...	5 multiporous (4–7).	Single areolar pores	?
Bisinuata...	Well developed.	Sinus on either side of lyrule.	Primary and accessory; 4–7 uniporous septula.	Absent ..	9 multiporous (3–5).	About 10 paired septula on each side.	3 or 4 multiporous (3).
Arafurensis	Well developed.	Sinus on either side of lyrule.	Primary; multiporous septula.	Absent .	?	?	?
Marginata	Well developed.	Absent	Primary: multiporous septula (2–3).	Absent .	9 multiporous (2–7)	About 8 paired septula on each side	?
Dorsiporosa	Weak ...	Absent	Primary. with multiporous septula (2–5): accessory.	Absent ..	9 multiporous in two rows (2–4)	?	About 8 multiporous (2–4).
Chuakensis hastingsae.	Well developed.	Absent	Primary and accessory, both uniporous.	Absent ...	9 multiporous (3–4).	About 12 paired septula on each side.	Scattered uniporous.
Ellerii	Well developed.	Well developed	Primary; uniporous septula.	Well developed.	5 multiporous (3–5).	Absent	Crescentic dietella; 10 uniporous septula.
Tuberosa ...	Well developed.	Weak	Primary multiporous septula (3–4); accessory uniporous (2–3).	Very large	Multiporous	?	?

Note.—It was not possible to obtain all the details of structure for some of the species and where the structure has not been seen a query has been inserted. The bracketed numbers refer to either the number of pores in the multiporous septula or to the number of uniporous septula in a radicular chamber.

Key to the genera.

1.	Zoarium fenestrate	*Petralia* Macgillivray.
	Zoarium not fenestrate	2.
2.	Suboral mucro absent	3.
	Suboral mucro present	4.
3.	Proximal rim entire	*Hippopetraliella*, nov.
	Proximal rim serrate	(*Serripetraliella*), nov.
	Proximal rim bisinuate	*Petraliella* Canu and Bassler.
4.	Lyrule absent	*Sinupetraliella*, nov.
	Lyrule present	5.
5.	Few radicular chambers....................	*Mucropetraliella*, nov.
	Primary and numerous accessory chambers	(*Poripetraliella*), nov.

Systematic Description.

Genus **Petralia** Macgillivray, 1869.

Petralia Macgillivray, Trans. Proc. Roy. Soc. Victoria, ix, 1869, p. 141.

Petralia Macgillivray, Trans. Proc. Roy. Soc. Victoria, xxiii, 1887, p. 212.

(Not *Petralia* Canu and Bassler, U.S. Nat. Museum, Bull. 100, ix, 1929, p. 253.)

Type (by monotypy): *Petralia undata* Macgillivray, 1869.

Diagnosis.—Zoarium unilaminate, fenestrate and attached by radicles arising from the proximal region only. Aperture circular, with or without cardelles and lyrule. A suboral mucro with avicularium is always present, while small avicularia may also occur on the lateral margins of the aperture. The zooecia are distinctly defined on the basal side, their surfaces being tuberculate and pitted with numerous small bordered radicular septula.

Observations.—Canu and Bassler's genus *Petralia* differs from that of Macgillivray. The description given applies solely to "*Lepralia*" *japonica* Busk, 1884, which was wrongly chosen as the genotype by Canu and Bassler, as pointed out by Hastings[11].

Canu and Bassler have referred to Levinsen as the major author of *Petralia*, but this is incorrect since no description of the genus is given by Levinsen. Levinsen[12] does, however, give an excellent general account of the features of the species which he refers to his new family Petraliidae, but makes no attempt at precise description of *Petralia*, which he uses in a very broad sense—" . . . I must provisionally refer them all to a single genus *Petralia* Macgillivray; but I do not doubt that this in time will be divided into several." Thus *Petralia* of Canu and Bassler is also not that of Levinsen.

To Macgillivray's original description is added in 1887, the presence of "a sharp denticle on each side below" in the aperture. This feature has not been seen in typical Victorian specimens of *P. undata* in the Macgillivray collection, but was probably added from specimens of *P. livingstonei* sp. nov.

The species referred to this genus are: *P. undata* Macgillivray, 1869, and *P. livingstonei* sp. nov.

Petralia undata Macgillivray, 1869.

(Figure 7.)

Petralia undata Macgillivray, Trans. Proc. Roy. Soc. Vict., ix., 1869, p. 141.

Petralia undata Macgillivray, in McCoy's Prodr. Zool. Victoria, dec. vi, 1881, p. 45, pl. lx, fig. 2.

(Not *Petralia undata* Livingstone, Rec. Austr. Mus., xv, 2, 1926, p. 169, pl. xii, figs. 1–3 = *P. livingstonei* sp. nov.)

Diagnosis.—Zoarium unilaminate, forming a large biscuit-brown fan-shaped colony up to 10 cms. in width. The fenestrae are sub-circular and about 2 mms. in their greatest diameter.

Zooecium elongate-pyriform in outline. Frontal rugose, with a few scattered tremopores and a marginal series of about ten areolae on each side. Aperture circular, without cardelles or lyrule, surrounded by a narrow, smooth area which

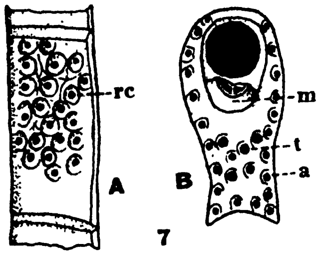
[11] Hastings.—Sci. Repts. Grt. Barrier Reef Exped. (1928–29), iv, 12, Polyzoa, 1932, p. 436.
[12] Levinsen.—Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 350.

expands proximally to form the elevated rugose mucro with pertaining avicularium. Basal lamina with about twenty radicular septula situated in deep pits in the distal two-thirds of the zooecium. Ovicell of large size, globular and loosely adherent to the distal zooecium.

Dimensions.—Zooecium, length 0·88 mm., greatest width 0·46; aperture, diameter 0·22.

Distribution.—Victoria: Queenscliff (type locality), Portland (Macgillivray); Western Port (J. Gabriel coll.); Barwon Heads (W. Baragwanath coll.). South Australia (Macgillivray).

Observations.—This species differs from *P. livingstonei* in the form of the zoarium, absence of cardelles and lyrule and the greater number of pores in the multiporous septula of the lateral walls.



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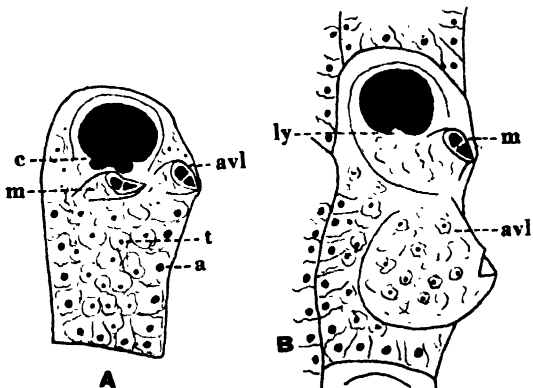

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Figures 7, 8.

(Magnification × 30.)

Figure 7.—*Petralia undata.* A. Basal lamina showing salient ridges outlining the zooecia and the sunken radicular chambers restricted to the distal two-thirds of the zooecium. B. Zooecial detail. Figure 8.—*Petralia livingstonei.* A. Zooecial detail, showing suboral avicularium and lateral avicularium of a normal zooecium. B. Abnormal zooecium situated on the margin of a fenestra, showing displacement of the suboral mucro and the great development of the lateral avicularium. a, areolae; avl, lateral avicularium; c, cardelle; ly, lyrule; m. suboral mucro; rc, radicular chamber; t, tremopore.

Petralia livingstonei, sp. nov.

(Figure 8.)

Petralia undata Livingstone (*non* Macgillivray), Rec. Austr. Mus., xv, 2, 1926, p. 169, pl. xii, figs. 1–3.

Diagnosis.—Zoarium unilaminate, forming a cream-coloured, elongate fan-shaped colony up to 5 cms. in length. The fenestrae are elongate-elliptical and about 5 mms. in their greatest diameter.

Zooecium subrectangular in outline. Frontal rugose, with several (about twelve) scattered tremopores and a marginal series of about eight areolae on each side. Aperture sub-circular, with a pair of moderately developed cardelles and a weak, narrow lyrule, surrounded by a narrow smooth band expanding proximally into the suboral mucro with pertaining avicularium. A small lateral avicularium is also usually present at the level of the mucro. When the zooecium borders a fenestra the lateral avicularium is greatly enlarged. Basal lamina with about twenty radicular septula scattered over the entire wall. Ovicell not observed.

Dimensions.—Zooecium, length 1·15 mms., greatest width 0·70; aperture, diameter 0·26.

Distribution.—New South Wales: S.W. off Eden at 45 fathoms (type locality), 3 to 4 miles off Eden at 25 to 30 fathoms, 12 to 22 miles N. ½ E. from Green Cape at 39 to 46 fathoms (Livingstone); off Shoalhaven (J. Gabriel coll.). South Australia: Off Beachport at 200 fathoms (Sth. Austr. Mus. coll.). Tasmania: Off Launceston and Devonport (Austr. Mus. coll. No. E·6472).

Observations.—This species differs from the genotype in its different form of zoarium, greater zooecial dimensions, frontal detail and the presence of cardelles and lyrule. The species is named for A. A. Livingstone, Assistant Zoologist at the Australian Museum, whose generous assistance is gratefully acknowledged.

Genus **Petraliella** Canu and Bassler, 1927.

Petraliella Canu and Bassler, Proc. U.S. Nat. Museum, lxix, Art. 14, 1927, p. 5.

Petraliella Canu and Bassler, U.S. Nat. Museum, Bull. 100, ix, 1929, p. 255, text figs. 105 A–F, 106 A, P.

Type (by original designation): *P.* ("*Escharella*") *bisinuata* (Smitt, 1873).

Diagnosis.—Zoarium unilaminate, not fenestrated, creeping over algae and other unstable substrata to which it is attached by radicles arising from primary, or both primary and accessory, radicular chambers situated distally on each zooecium. Aperture sub-circular, with a pair of well-developed cardelles. Proximal rim indented by two large sinuses forming a pair of lateral bounding denticles and a median lyrule. Frontal with numerous regularly-scattered tremopores. No suboral mucro.

Observations.—The genus *Petraliella* is here much restricted from its original very wide application. As seen from the diagnosis, it admits forms with a bisinuate proximal rim and no suboral mucro. The following species are included in the genus:—

Petraliella bisinuata (Smitt, 1873).

Petraliella bisinuata grandis Canu and Bassler, 1928.

Petraliella buski, sp. nov.

Petraliella arafurensis, sp. nov.

Petraliella bisinuata (Smitt, 1873).

(Figure 9.)

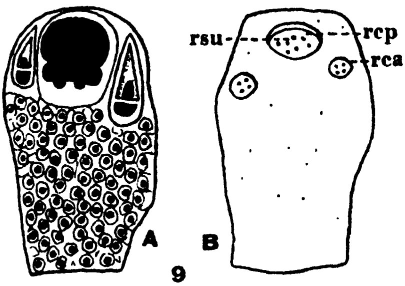
Escharella bisinuata Smitt, Kongl. Svenska Vetensk.—Akad. Handl., ii, (4), 1873, p. 59, pl. xii, fig. 229.

Petralia bisinuata (Smitt), Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, pp. 350, 351.

Petraliella bisinuata (Smitt), Canu and Bassler, Proc. U.S. Nat. Museum, lxxii, Art. 14, 1928, p. 78, pl. xvi, figs. 1–5, pl. xxxiii, fig. 4, text figs. 12 A–H.

(Not *Mucronella bisinuata* Busk (*non* Smitt), Chall. Rep. Zool., x, 1884, pt. xxx, p. 157, pl. xix, fig. 5 = *Petraliella buski*, sp. nov.

Diagnosis.—Zoarium unilaminate, colour bright vermilion when alive, light brown when dry. Zooecium subrectangular in outline. Frontal with numerous (60 to 70) regularly-placed tremopores situated within shallow pits. Aperture sub-circular, with moderately developed cardelles situated close to proximal rim on the lateral margins. The sinuses do not extend far into the suboral smooth plate which is comparatively wide in this species.



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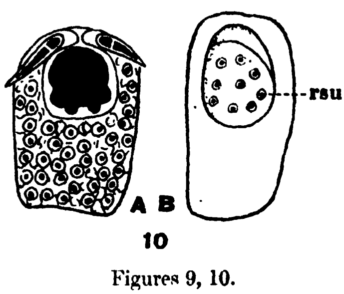

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Figures 9, 10.

(Magnification × 30.)

Figure 9.—*Petraliella bisinuata*. A. Zooecial detail. B. View of basal lamina, showing primary and accessory radicular chambers, both with uniporous septula. Figure 10.—*Petraliella arafurensis*. A. Zooecial detail. B. Basal lamina, showing large primary radicular chamber with uniporous septula. rca, accessory radicular chamber; rcp, primary radicular chamber; rsu, uniporous septula of radicular chambers.

Avicularia somewhat variable, but usually a large one is placed longitudinally, extending on one side of the aperture and below the level of the proximal rim; a smaller longitudinal avicularium occurs on the opposite side of the aperture. The apices point distally.

The primary radicle is inserted into a definite distal chamber partly roofed by calcareous deposition and communicating with the zooecium by scattered uniporous septula. Accessory radicular chambers are also present. The closely and finely perforate ovicell is very globular and equals in length half that of the zooecium.

Dimensions.—Zooecium, length 1·14 mms., greatest width 0·57; aperture, length 0·28, width 0·25.

Distribution.—Recent: Gulf of Mexico at various localities from 21 to 30 fathoms (details, Canu and Bassler[13]); Florida at 14 to 30 metres (Smitt); Tortugas at 16 to 29 metres (Osburn).

Pliocene: Minnitimmi Creek on Bocas Island (Almirante Bay, Panama).

Observations.—The position of the avicularia, although not a rigid feature, characterises this species, together with the well-roofed radicular chamber and the large size of the zooecia.

Petraliella buski, sp. nov.

Mucronella bisinuata Busk (*non* Smitt, 1873), Chall. Rep. Zool., x, 1884, pt. xxx, p. 157, pl. xix, fig. 5.

Petralia bisinuata (Busk) (*non* Smitt, 1873), Livingstone, Rec. Austr. Mus., xvi, 1, 1927, p. 66.

Observations.—Specimens of this species have not been seen by the author, Busk's figures and description alone forming the basis of comparison with specimens of *Petraliella bisinuata* (Smitt, 1873) from the Gulf of Mexico ("Albatross" station D 2405) obtained by exchange with the United States National Museum.

The following points of difference between the two species may be noted:—1. The frontal of *P. buski* is more convex and has far fewer tremopores; 2. The zooecia are much more elongate in *P. bisinuata*; 3. The avicularia of *P. bisinuata* have a fairly constant disposition on either side of, and below, the aperture with the apices directed distally, whereas in *P. buski* they are arranged around the margins of the zooecia and on the frontal, showing no definite orientation. On these grounds, the "Challenger" species is regarded as distinct.

Distribution.—"Challenger" Station 190 (lat. 8° 56′ S., long 136° 5′ E.) at 49 fathoms, green mud (Arafura Sea) (Busk).

Petraliella arafurensis, sp. nov.

(Figure 10.)

?*Mucronella bisinuata* Kirkpatrick (*non* Smitt, 1873), Sci. Proc. Roy. Dub. Soc., (n.s.), vi, 10, 1890, p. 612.

Diagnosis.—Zooecia sub-quadrate in outline. The slightly convex frontal has numerous (about 40) regularly-placed tremopores surrounded by polygonal

[13] Canu and Bassler.—Proc. U.S. Nat. Museum, lxxii, art. 14, 1928, p. 80.

ridges. The avicularia, with elongated triangular mandibles, are placed on either side of the distal rim of the aperture, pointing outward and slightly downward. Occasionally an avicularium may develop on the frontal.

The radicle is inserted into a usually rather large radicular chamber often occupying as much as half the area of the basal lamina and communicating by several uniporous septula with the zooecium. No accessory chambers have been observed. The ovicell is not known.

Dimensions.—Zooecium, length 0·8 mm., greatest width 0·57; aperture, length 0·23, width 0·22.

Distribution.—North-east Australia: Thursday Island (Aust. Mus. coll.).

Type Material.—Holotype and paratypes, Aust. Mus. Coll. No. U 510.

Observations.—Kirkpatrick's specimens of "*Mucronella bisinuata*" came from Albany Passage, Somerset, quite near the type locality of this species, and his form is more likely to be this species than *P. buski*, which occurs much further west.

This species differs from *P. bisinuata* in its smaller dimensions and from both the preceding species in the constant distal pair of avicularia directed outward and downward.

Genus **Hippopetraliella**, gen. nov.

Type: *H.* ("*Lepralia*") *dorsiporosa* (Busk, 1884).

Diagnosis.—Zoarium unilaminate, not fenestrated. Primary and often accessory radicular chambers are situated distally on each zooecium. Aperture subquadrate with a pair of cardelles situated on the lateral margins close to the entire, slightly concave proximal rim bounded by a fairly broad smooth plate. The suboral plate may be indented by numerous small sinuses (sub-genus *Serripetraliella*).

Observations.—The members of typical *Hippopetraliella* have an entire proximal rim, but the proximal rim in the sub-genus *Serripetraliella* shows numerous small indentations. The species placed in *Hippopetraliella* (*sensu stricto*) are :—

Hippopetraliella ("*Lepralia*") *dorsiporosa* (Busk, 1884).

Hippopetraliella ("*Petraliella*") *crassocirca* (Canu and Bassler, 1929).

Hippopetraliella dorsiporosa (Busk, 1884).

(Figure 11.)

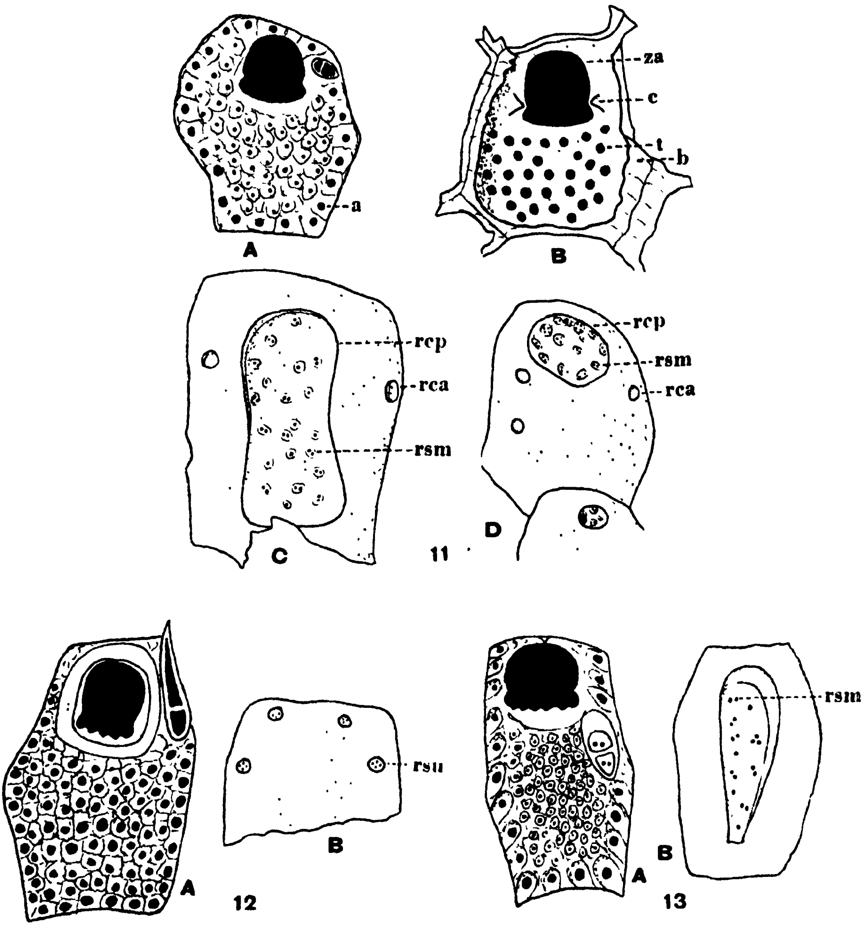
Lepralia dorsiporosa Busk, Chall. Rep. Zool., x, 1884, pt. xxx, p. 143, pl. xviii, fig. 4.

Lepralia dorsipora Busk, Kirkpatrick, Sci. Proc. Roy. Dub. Soc., (n.s.), vi, 10, 1890, p. 612.

Petralia dorsiporosa (Busk), Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 351.

Petraliella dorsiporosa (Busk), Canu and Bassler, U.S. Nat. Museum, Bull. 100, ix, 1929, pp. 250–253, text figs. 103 A, E, G.

Diagnosis.—Zooecium sub-ovate in outline. The slightly convex frontal has numerous (about sixty) tremopores, bounded by raised polygonal ridges, and a series of areolae around the margin. The small avicularia are placed transversely on either side of the aperture, the apices pointing outward.



Figures 11, 12, 13.

(Magnification × 30.)

Figure 11.—*Hippopetraliella dorsiporosa.* A. Zooecial detail. B. View of frontal with basal lamina removed. C. Basal lamina, showing an extraordinarily large primary radicular chamber. D. View of basal lamina, showing primary and accessory radicular chambers. Figure 12.—*Hippopetraliella* (*Serripetraliella*) *chuakensis hastingsae.* A. Zooecial detail. B. View of basal lamina with scattered uniporous radicular septula. Figure 13.—*Hippopetraliella* (*Serripetraliella*) *marginata.* A. Zooecial detail. B. View of basal lamina, showing a large primary radicular chamber with multiporous septula. a, areolae; b, basal lamina; c, cardelle; rca, accessory radicular chamber; rcp, primary radicular chamber; rsm, multiporous septula of radicular chamber; rsu, uniporous septula of radicular chamber; t, tremopore; za, aperture of zooecium.

The basal lamina is provided with a large distal primary radicular chamber and a few accessory latero-distal chambers. The distal radicular chamber may occupy as much as two-thirds of the area of the basal lamina and communicates with the zooecium by numerous few-pored multiporous septula. The ovicell is globular, circular in outline and is placed on the proximal third of the distal zooecium.

Dimensions.—Zooecium, length 0·95 mm., greatest width 0·80: aperture, length 0·28, width 0·25.

Distribution.—North-east Australia: "Challenger" Station 186 (Cape York, lat. 10° 30′ S., long. 142° 18′ E.) at 8 fathoms, coral mud (Busk); Albany Passage (Somerset, north Queensland) at 10 fathoms, channels between reefs at Murray Island from 15 to 20 fathoms (Kirkpatrick).

West Australia: 42 miles WSW off Cape Jaubert at 12 fathoms (Marcus).

Additional localities represented in the Australian Museum collection are: 5 to 8 fathoms at Murray Island (coll. Hedley and MacCulloch); Point Cartwright and Darnley Island (Queensland).

Sub-genus **Serripetraliella**, sub-gen. nov.

Type: *Hippopetraliella* (*Serripetraliella*) *chuakensis* (Waters, 1913).

Diagnosis.—This sub-genus possesses the main characters of *Hippopetraliella*, but the proximal rim is indented by several sinuses.

The species belonging to this sub-genus are: —

H. (*Serripetraliella*) *chuakensis* (Waters, 1913).
H. (*Serripetraliella*) *chuakensis hastingsae*, var. nov.
H. (*Serripetraliella*) *marginata* (Canu and Bassler, 1928).

H. (Serripetraliella) chuakensis hastingsae, var. nov.

(Figures 6A and 12.)

Petralia chuakensis Livingstone (*non* Waters), Rec. Austr. Mus., xv, 1, 1926, p. 99.

Petralia chuakensis Hastings (*non* Waters), Sci. Repts. Great Barrier Reef Exped. (1928–29), iv, 12, 1932, p. 436.

Observations.—As Hastings points out, there is practically no difference in the zooecial detail of the East African (typical form) and the north-eastern Australian specimens, except that the primary radicular chambers of Waters' specimens are much larger than in her specimens (accessory chambers are also present in the East African specimens according to Waters' figure[14]).

The following differences in zooecial detail are noted, viz., that the smooth band surrounding the aperture is narrower in var. *hastingsae* and does not show the slight median encroachment on the aperture which is seen in Waters' figure. A more fundamental difference is that, according to Waters' description, there are only five few-pored multiporous septula in the lateral walls, while in the present variety there is an average of nine septula with three to four pores. On these grounds it seems advisable to erect a new variety for the reception of the north Australian form.

[14] Waters.—Proc. Zool. Soc. London, 1913, pl. lxx, fig. 14.

Dimensions.—Zooecium, length 1·25 mms., greatest width 0·86; aperture, length 0·30, width 0·26.

Distribution.—Low Isles (Hastings), Daru Island (Torres Strait) (Livingstone). Additional specimens in the National Museum (Melbourne) are from the Barrier Reef and, in the Australian Museum, from Murray Island (coll. E. H. Mathews, 1926).

H. (Serripetraliella) marginata (Canu and Bassler, 1928).

(Figure 13.)

Petraliella marginata Canu and Bassler, Proc. U.S. Nat. Museum, lxxii, Art. 14, 1928, p. 80, pl. xvi, figs. 6–11, text fig. 12 I.

Observations.—Nothing is added to Canu and Bassler's fine study of this species, but the statement that the ovicell is closed by the operculum does not appear to be borne out by their excellent figures (pl. xvi, figs. 10, 11).

Distribution.—Various localities in the Gulf of Mexico from 26 to 43 fathoms (Canu and Bassler).

Genus **Mucropetraliella**, gen. nov.

Type: *M.* ("*Lepralia*") *ellerii* (Macgillivray, 1869).

Diagnosis.—Zoarium unilaminate, not fenestrate. Primary, and often accessory, radicular chambers with uniporous septula are situated distally on the basal lamina of each zooecium. The primary radicular chamber is partly surrounded on the distal border by a crescentic dietella. The aperture is sub-circular and has a pair of more or less well-developed cardelles and a median lyrule often asymmetrically placed. Frontal with numerous or several irregularly-scattered tremopores bounded by radiating ridges. A more or less well-developed suboral mucro projects over the aperture and supports an avicularium.

Observations.—This genus is characterized by the presence of the suboral mucro, lyrule and pair of cardelles. The following forms are placed in this genus:—

M. ("*Lepralia*") *ellerii* (Macgillivray, 1869).
M. ("*Mucronella*") *vultur* (Hincks, 1882).
M. ("*Mucronella*") *vultur biaviculata* (Waters, 1887).
M. ("*Petralia*") *armata* (Waters, 1913).
M. ("*Petralia*") *laccadivensis* (Robertson, 1921).
M. ("*Petralia*") *bennetti* (Livingstone, 1926).
M. ("*Petralia*") *serrata* (Livingstone, 1926).
M. ("*Petraliella*") *albirostris* (Canu and Bassler, 1927).
M. ("*Petralia*") *halei* (Livingstone, 1928).
M. ("*Petralia*") *neozelanica* (Livingstone, 1929).
M. ("*Petraliella*") *trita* (Canu and Bassler, 1929).
M. ("*Petraliella*") *robusta* (Canu and Bassler, 1929).
M. ("*Petraliella*") *philippinensis* (Canu and Bassler, 1929).
M. ("*Petraliella*") *falcifera* (Canu and Bassler, 1929).
M. ("*Petraliella*") *verrucosa* (Canu and Bassler, 1929).
M. ("*Petraliella*") *tubulifera* (Canu and Bassler, 1929).
M. ("*Petraliella*") *echinata* (Canu and Bassler, 1929).
M. ***nodulosa***, sp. nov.
M. ***ligulata***, sp. nov.

Mucropetraliella ellerii (Macgillivray, 1869)

(Figure 14.)

Lepralia ellerii Macgillivray, Trans. Proc. Roy. Soc. Vic., ix, 2, 1869, p. 135.

Lepralia ellerii Macgillivray, *in* McCoy's Prodr. Zool. Victoria, dec. iv, 1879, p. 31, pl. xxxvii, fig. 8.

Mucronella ellerii (Macgillivray), Trans. Proc. Roy. Soc. Vic., xxiii, 1887, p. 213.

Petralia ellerii (Macgillivray), Levinsen, Morph, Syst. Stud. Cheil. Bryozoa, 1909, p. 351.

Diagnosis.—Zooecium sub-quadrate in outline. The frontal, sloping regularly upward from the lateral and proximal margins to the suboral mucro, is ornamented by strong bifiurcating ridges radiating from the mucro, between which are situated the tremopores (about 40). The mucro, overarching the proximal portion of the aperture, is small in extent and not very salient, but supports a small avicularium opening towards the aperture. On either side of the mucro on the proximal margin of the aperture there is often a small short protuberance followed by a small avicularium which varies in its position on the lateral margins of the aperture.

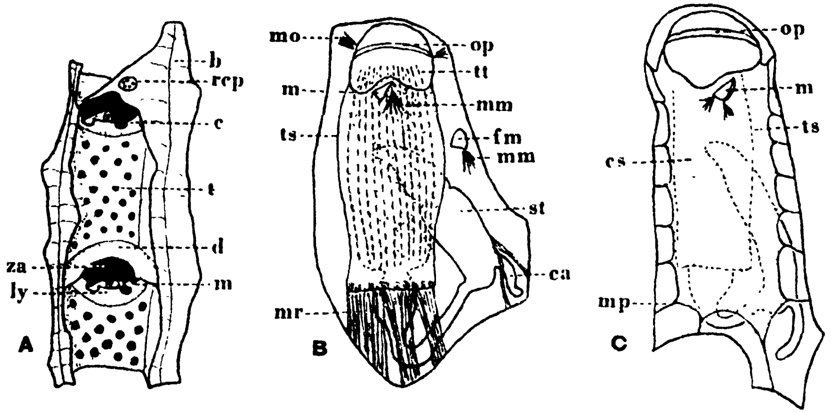


Figure 14.

Mucropetraliella ellerii. A. Apertural detail and structure of frontal as seen after removal of the basal lamina. × 30. b, basal lamina; c, cardelle; d, distal wall; ly, lyrule; m, suboral mucro; rcp, primary radicular chamber; t, tremopore; za, aperture of zooecium. B. Anatomical detail seen below the level of the compensatrix. × 72. C. Preparation showing compensatrix and associated parietal muscles. × 72. ca, caecum; cs, compensatrix; fm, mandible of frontal avicularium; m, mandible of suboral avicularium; mm, muscles of avicularia; mo, opercular muscles; mp, parietal muscles; mr, retractor muscles of the polypide; op, operculum; st, stomach; ts, tentacle sheath; tt, tentacles.

The subcircular aperture has a broad shallow lyrule and sharply-pointed cardelles. The basal lamina of each zooecium is supplied with a single small primary radicular chamber communicating with the zooecium by about five uniporous septula. The ovicell is broadly crescentic in outline and occupies the proximal half of the frontal of the distal zooecium.

Dimensions.—Zooecium, length 0·72 mm., greatest width 0·65; aperture, length 0·25, width 0·31.

Distribution.—Victoria: Williamstown, Warrnambool (Macgillivray); Port Phillip (Waters); Point Leo (Shoreham, Western Port), San Remo, Balnarring (Western Port) (Stach coll.). Tasmania (Waters). South Australia (Macgillivray).

Observations.—The variations noted are as follows: The avicularia at the sides of the aperture may be both absent, or only one may be present. The protuberances on either side of the mucro may be so slightly developed as to be scarcely noticeable. Occasionally an avicularium occurs on the frontal distal to an ovicell. The small size of the mucro is a very characteristic feature.

Having the opportunity of collecting living material of this species, stained decalcified mounts were prepared, and the following points were noted:—

(*a*) *Compensatrix.*—In adult zooecia the compensatrix is a much elongated sac attached to the lateral body wall by about fourteen bundles of parietal muscles and to the proximal body wall by a pair of parietal muscle bundles.

(*b*) *Polypide.*—The polypide has the usual large number of tentacles (26) typical of Petraliidae. It is interesting to note that this species has a similar long, slender caecum to that figured by Hastings[15] for *Sinupetraliella litoralis* (Livingstone).

(*c*) *Proximal musculature.*—The retractor muscles of the polypide appear to be arranged in definite bundles. A large bundle is attached to that side of the base of the tentacle sheath opposite to which the alimentary canal opens out, while two smaller bundles are attached to the base of the tentacle sheath and extend on either side of the oesophagus to their attachment on the proximal region of the body wall. From the outer side of the stomach, beyond the caecum, a pair of muscle bands are developed, the more distal one attached to the lateral region of the body wall and the proximal one to the proximal region of the body wall. The function of the latter pair of muscles appears to be for the proximal and lateral displacement of the lower regions of the alimentary canal when protrusion of the polypide takes place.

Mucropetraliella vultur (Hincks, 1882) **(sensu stricto).**

(Figures 6B and 15.)

Mucronella vultur Hincks, Ann. Mag. Nat. Hist., (5), x, 1882, p. 98, pl. viii, fig. 2.

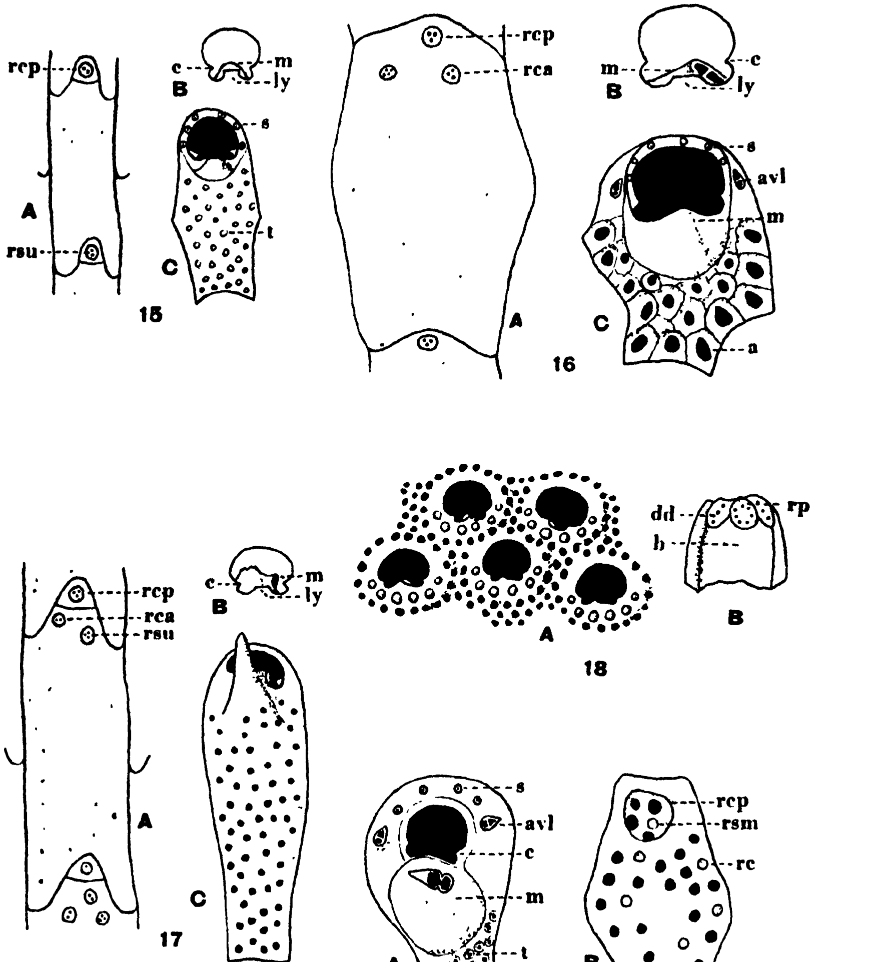
Mucronella ellerii var. *vultur* Waters, Ann. Mag. Nat. Hist., (5), xx, p. 195.

Petralia vultur (Hincks), Livingstone, Rec. South Austr. Museum, iv, 1, 1928, p. 123, text fig. 34.

Diagnosis.—The zooecia are elongate, subrectangular in outline, and about twice as long as broad. The frontal becomes increasingly convex from the proximal margin as it approaches the mucro. The mucro has a squat protuberance near the avicularium, projecting slightly over the proximal rim.

The distal rim of the aperture bears about six spinous processes. The lyrule is moderately broad, but projects much further into the aperture than is the case in *M. ellerii*. Primary radicular chambers only have been observed, and these communicate with the zooecium by uniporous septula. The trace of the distal dietella is conspicuous on the basal lamina. The longitudinal and transverse diameters of the finely perforate ovicell are approximately equal.

[15] **Hastings.—Sci. Repts. Grt. Barrier Reef Exped. (1928–29), iv, 12, Polyzoa, 1932, text fig. 15 D.**



Figures 15–19.

(Magnification × 30.)

Figure 15.—*Mucropetraliella vultur.* A. View of basal lamina showing roofed primary radicular chamber. B. Apertural detail. C. Zooecial detail. Figure 16.—*Mucropetraliella halei.* A. View of basal lamina, showing primary and accessory radicular chambers. B. Apertural detail. C. Zooecial detail. Figure 17.—*Mucropetraliella ligulata.* A. View of basal lamina, showing roofed primary radicular chamber and accessory radicular chambers. B. Apertural detail. C. Zooecial detail. Figure 18.—*Mucropetraliella nodulosa.* A. Zooecial detail. B. Interior view of basal lamina. Figure 19.—*Mucropetraliella* (*Poripetraliella*) *tuberosa.* A. Zooecial detail. B. View of basal lamina, showing primary radicular chamber with multiporous septula and numerous accessory radicular chambers. a, areolae; avl, lateral avicularium; b, basal lamina; c, cardelle; dd, distal crescentic dietella; ly, lyrule; m, suboral mucro; rc, radicular chamber; rca, accessory radicul.r chamber; rcp, primary radicular chamber; rp, radicular plate; rsm, multiporous septula of radicular chamber; rsu, uniporous septula of radicular chamber; s, spine trace; t, tremopore.

Dimensions.—Zooecium, length 0·85 mm., greatest width 0·41: aperture, length 0·20, width 0·25; ovicell, longitudinal diameter 0·47, transverse diameter 0·50.

Distribution.—Victoria: Port Phillip Heads, Portland, Warrnambool (Macgillivray); Western Port (J. Gabriel coll.). South Australia: 7 miles south-west from Newland Head (Encounter Bay) at 20 fathoms (Livingstone); off Beachport at 200 fathoms (Sth. Aust. Mus. coll.). New South Wales: Taylor Bay (Whitelegge).

Observations.—The above description of Hincks' species (*sensu stricto*) is based on Victorian material in the Macgillivray collection and material from Western Port dredged by J. Gabriel. Normally the mucro is quite small and rarely attains the convexity of many of its congeners. Frontal avicularia occur very rarely in the series examined and no accessory radicular chambers were noted.

Within recent years, Livingstone has erected three varieties of this species (var. *serrata*, var. *bennetti*[16], and var. *noezelanica*[17]) which we agree, as he has suggested, should be raised to specific status. Waters' *Mucronella ellerii* var. *biaviculata*[18] is obviously the typical *M. vultur*, except that the squat protuberance of the mucro bears a small avicularium, and it is here regarded as being a variety of *M. vultur*.

Mucropetraliella halei (Livingstone, 1928).

(Figure 16.)

Petralia halei Livingstone, Rec. South Austr. Museum, iv, 1, 1928, p. 123, text fig. 35.

Note.—A discovery of further material in a moderately well-preserved condition permits a more complete description of this species to be given. Livingstone's single fragment, in a very much abraded condition, did not permit a full study of this species. The present specimens also lack the ectocyst and accompanying structures, while the ovicell still remains unknown.

Diagnosis.—The zooecia are broadly pyriform in outline. The frontal is deeply areolated and has a few tremopores scattered below the proximal margin of the broad convex mucro which possesses a moderately large avicularium, and projects slightly over the proximal rim.

The broad aperture has a shallow, blunted lyrule only seen from the interior. On the distal margin six spine traces are present, while situated proximally to them are a pair of small lateral avicularia directed distally. The basal lamina has a primary and usually two accessory radicular chambers communicating with the zooecia by uniporous septula.

Dimensions.—Zooecium, length 1·04 mms.; greatest width, 0·88: aperture, length 0·32, width 0·42.

Distribution.—South Australia: Beachport (Livingstone); off Beachport at 200 fathoms (Sth. Aust. Mus coll.).

Observations.—This species is readily distinguished by the broad zooecia, enormous aperture and broad low mucro.

[16] Livingstone.—Rec. Austr. Museum, xv, 1, 1926, pp. 95–96.
[17] Livingstone.—Vidensk. Medd. fra Dansk Naturh. Foren., lxxxii, 1929, p. 74.
[18] Waters.—Ann. Mag. Nat. Hist., 5, xx, 1887, p. 194.

Mucropetraliella ligulata, sp. nov.

(Figures 6c and 17.)

Diagnosis.—The zooecia are large, pyriform and very attenuated, the length being more than three times the greatest width. The frontal, with numerous scattered tremopores, is slightly convex and develops a mucro with a long, slender spine projecting forward and upward over the aperture. A small avicularium is developed laterally at its base. The portion of the base of the spine opposite the avicularium extends distally over the aperture, completely concealing the cardelle. No spine traces on the distal rim of the aperture were noted in the present series. Internally, the lyrule and cardelles are seen to agree closely with those of *M. vultur*.

The basal lamina shows a central primary radicular chamber and usually two or three accessory chambers, communicating with the zooecia by uniporous septula and partly surrounded by the distal dietella. The longitudinal diameter of the finely perforate ovicell is much greater than its transverse diameter.

Dimensions.—Zooecium, length 1·45 mms.; greatest width 0·45; aperture, length 0·19, width 0·27: ovicell, longitudinal diameter 0·51, transverse diameter 0·39.

Distribution.—South Australia: Off Beachport at 200 fathoms (Sth. Aust. Mus. coll.).

Observations.—This distinctive form attains almost twice the length of *M. vultur* (Hincks), and is particularly characterised by its slender zooecia and the great length of the spinous process of the suboral mucro which, in the figure, is considerably foreshortened owing to its tendency to project upward.

Type Material.—Syntypes: Sth. Aust. Mus. Coll, Regd. No. L. 1: two fragments, one bearing an ovicell.

Mucropetraliella nodulosa, sp. nov.

(Figure 18.)

Diagnosis.—The zooecia are elongate pyriform in outline, with the proximal region much constricted. The frontal has a few (about twelve) scattered tremopores separated by salient polygonal ridges. The mucro is of small size and hides the lyrule. Surrounding the proximal rim are a series of six protuberances placed symmetrically with regard to the longitudinal axis of the zooecium. The basal lamina has primary radicular chambers communicating with the zooecia by about seven uniporous septula and surrounded by a well-marked distal dietella.

Dimensions.—Zooecium, length 0·57 mm., width 0·33: aperture, length 0·14, width 0·21.

Distribution.—Western Australia: Perth (Aust. Mus. Coll.).

Observations.—This species somewhat resembles *M. ellerii* (Macgillivray), but is readily distinguished by the protuberances below the proximal rim and the fewer tremopores.

Type Material.—Holotype: Aust. Mus. Coll., Regd. No. U 2732.

Sub-genus **Peripetraliella,** sub-gen. nov.

Type: *Mucropetraliella* (*Poripetraliella*) *tuberosa* (Busk, 1884).

Diagnosis.—Zoarium unilaminate, not fenestrate. The primary radicular chambers communicate with the zooecia by a few multiporous septula, while numerous accessory radicular chambers are scattered over the basal lamina. The aperture possesses a lyrule and cardelles and a suboral mucro is present.

Observations.—This group, represented solely by the type, differs from *Mucropetraliella* (*sensu stricto*) in the multiporous septula of the primary radicular chamber and in the presence of numerous accessory radicular chambers occupying the remainder of the basal lamina. Its structure strongly supports the view that the genus *Petralia* is a fairly recent developmental trend in south-eastern Australian waters from a Mucropetraliellid stock, the present species providing a link between *Mucropetraliella* and *Petralia* by the proliferation of the accessory radicular chambers. The habitat and mode of attachment of *Petralia* is probably due to the loss of the primary radicular chamber, while the fenestration of the zoarium offers less resistance to currents than would an entire flat lamina.

Mucropetraliella (Poripetraliella) tuberosa (Busk, 1884).

(Figure 19.)

Lepralia tuberosa Busk, Chall. Rep. Zool., x, 1884, pt. xxx, p. 143, pl. xvii, fig. 7.

Petralia tuberosa (Busk), Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 351.

Diagnosis.—Zooecium pyriform in outline. Frontal with a number of small bordered tremopores in the region proximal to the rotund mucro, which supports a large avicularium. The distal rim of the aperture bears about four spine traces, below which, on either side of the aperture, is a small avicularium.

The basal lamina has a large distal primary radicular chamber communicating with the zooecium by about five multiporous septula each with three or four pores and numerous accessory chambers, with three or four pores, scattered over the remainder of the area of the basal lamina.

Dimensions.—Zooecium, length 1·02 mms., greatest width 0·71; aperture, length 0·23, width 0·27.

Distribution.—New South Wales: "Challenger" Station 163 B (off Port Jackson at 35 fathoms on hard ground) (Busk); Watson's Bay (Whitelegge); Broughton Island at 25 fathoms (Goldstein coll.); Manly Beach (Stach coll.).

Observations.—Superficially, this species resembles *M. halei* (Livingstone), but it is readily distinguished by the smaller dimensions of the aperture and the smaller and more numerous tremopores, apart from the difference in the radicular apparatus.

Genus **Sinupetraliella,** gen. nov.

Type: *S.* ("*Petralia*") *litoralis* (Livingstone, 1932).

Diagnosis.—Zoarium unilaminate, not fenestrate. Aperture with a pair of cardelles and no lyrule, the sinus thus formed being asymmetrical owing to the

greater development of one of the cardelles. Frontal with numerous bordered tremopores. A more or less well-developed suboral mucro, supporting an avicularium, partly conceals the aperture.

Observations.—This genus is characterised by the presence of a suboral mucro and absence of a lyrule. The following species are classed here :—

S. ("*Petralia*") *litoralis* (Livingstone, 1932).
S. ("*Petraliella*") *gigantea* (Canu and Bassler, 1929).
S. ("*Petraliella*") *grandicella* (Canu and Bassler, 1929).
S. ("*Petraliella*") *elongata* (Canu and Bassler, 1929).

INCERTAE SEDIS.

"Petralia" soulieri (Calvet, 1902).

Mucronella soulieri Calvet, Trav. Inst. Zool. Université Montpellier, (2), xi, 1902, p. 61, pl. ii, figs. 3, 4.

Petralia soulieri (Calvet), Barroso, Bol. Real Soc. Espanola de Hist. Nat., xxv, 4, 1925, p. 179, figs. 3–5.

Observations.—Barroso's excellent study of this species shows it to belong to Petraliidae. Its exact position is uncertain, but it appears to be related to *Mucropetraliella.* Unusual features recorded by Barroso are the uniporous septula of the lateral walls and the absence of cardelles and lyrule. The former character has not been recorded in any other member of Petraliidae, but the character of the radicular pores, presence of a suboral mucro and the aperture of the ovicell opening above the plane of the zooecial aperture appear to refer it to Petraliidae.

Possibly, as Barroso points out, there is a close structural relationship between this species and "*Petralia*" *mucronata* Canu, 1913[19] from the Lutetian (Middle Eocene) of France, and the former species may be a relict of the European Lower Tertiary Petraliid fauna. This, however, is mere supposition and a re-examination of the species concerned is necessary.

[19] Canu.—Bull. Soc. Geol. France (4) viii, 1913, p. 301.

DESCRIPTION OF THE MALE OF *CLEMACANTHA REGALE* RAINBOW.

By

KEITH C. MCKEOWN

(Assistant Entomologist, the Australian Museum, Sydney).

(Figures 1–3.)

In 1897 (*) the late W. J. Rainbow described a new genus and species of Phasmid under the name *Clemacantha regale* from a female example received from Narrabri, New South Wales. The species is a remarkable one, being the largest recorded from Australia, as well as being of exceptional beauty and delicacy of colour.

The male of this species remained unknown until January 29, 1933, when Capt. F. H. Andrew forwarded specimens of a male and female taken *in cop.* at Kempsey, New South Wales. Opportunity is now taken to describe the male. The female with which the male was paired was received in poor condition.

Two eggs were contained in the boat-shaped ovipositor of the female, and one of these is now figured as providing another link in the life history of this magnificent species. These eggs are, as usual in those of the Phasmidæ, very distinctive and quite unlike those of any other species known to me.

The original figure of the female is not entirely satisfactory, so I have had a new figure prepared by Miss N. B. Adams, of the Australian Museum, so that reliable illustrations of both sexes may now be available.

The location of the type female was not stated in Rainbow's paper, and it was presumed that it was housed in the Australian Museum, but a search of the collection has failed to reveal it. Its whereabouts are, therefore, unknown.

Clemacantha regale is represented in the Australian Museum collection by examples from Uralla, Camira Creek via Casino, Boomi, Laurieton, Kempsey, Singleton, and Garrawilla via Mullaley, New South Wales; Jandowie via Dalby, and Longreach, Queensland; Katherine, North Australia, Derby, North-West Australia, and Groote Eylandt.

Order **ORTHOPTERA.**

Family **PHASMIDAE.**

Sub-family **PTEROPHASMINA.**

Genus **Clemacantha** Rainbow.

Clemacantha Regale Rainbow, 1897.

♂. Measurements: Length from base of antennae to tip of abdomen, excluding anal styles, 142 mm.; length of head, 7 mm.; antennae, 55 mm.; thorax, 51 mm.; abdomen, 84 mm.; anal styles, 17 mm.; anterior femora, 35 mm.; hind femora, 38 mm.; wing, 90 mm.; tegmina, 27 mm.; greatest width of abdomen, 4 mm.; wing, 39 mm.; tegmina, 6 mm.

* **Rainbow.—Records Australian Museum, iii, 2, 5 Aug., 1897, p. 34, pl. ix.**

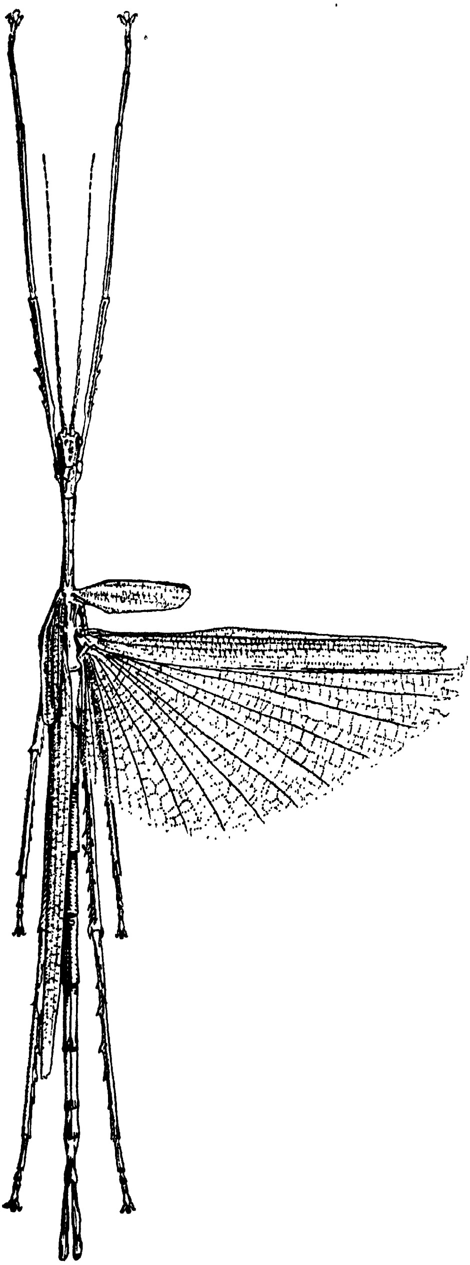


Fig. 1.—*Clemacantha regale* Rainb., male. (Slightly reduced).

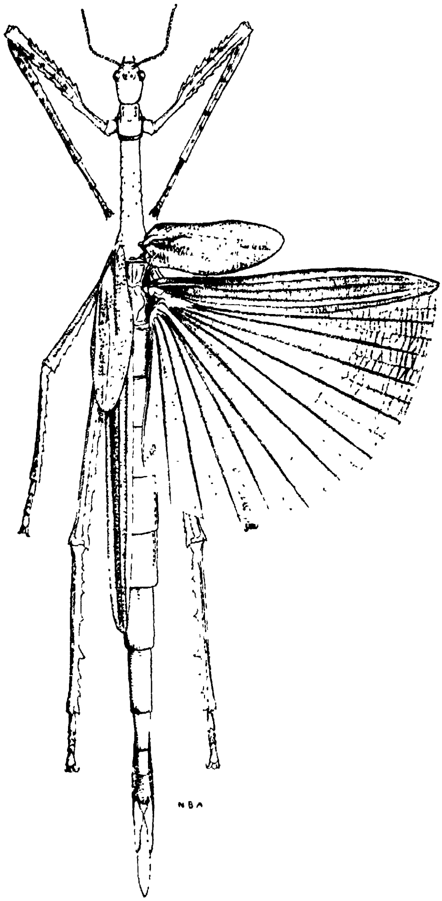


Fig. 2.—*Clemacantha regale* Rainb., female. (Reduced).

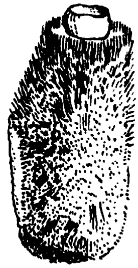


Fig. 3.—*Clemacantha regale* Rainb., egg. (× 5).

Head.—Pale yellow; face pale yellow; eyes black; ocelli bright yellow; antennae slender, 26-jointed, slightly pubescent.

Pronotum.—Green above, laterally yellowish; mesonotum light green, the upper and lower surface furnished with spines varying in size and shape; those above are slender and acutely pointed, brown above and green below; a single minute point occurs anteriorly on the median line, while the others (six in number) are placed somewhat laterally to the median line, and are arranged in pairs; the spines on the ventral surface are six in number, arranged obliquely in pairs, blunt and little more than raised bosses; they are surrounded by patches of dark green; ventral surface of metanotum light green, with three pairs of obliquely placed spines surrounded by patches of dark green. The posterior spines are acute, but not as slender as those on the dorsal surface of the mesonotum. A number of minute spines are situated upon the lateral margins, terminating in a larger and more acute spine anteriorly to the attachment of the third pair of legs.

Abdomen.—Apparently greenish, but badly discoloured in specimen, tapering gradually toward extremity; anal styles green, long and slender.

Tegmina.—Elongate, ovate, slightly angled at humeral and anal angles, green with three longitudinal white bars.

Wings.—Above, the costal area bright green with a white longitudinal bar; beneath, green; membranous portion delicate bluish-green.

Legs.—Long and slender, with strongly-denticulated ridges, mottled with green and yellow; femora and tibiæ strongly spined with a double row of spines below and a single row above on median line; first joint of tarsus longest; claws long and strongly curved; both front tarsi wanting.

Habitat.—Kempsey, New South Wales (Capt. F. H. Andrew.)

♂ Allotype in Australian Museum collection. Regd. No. K67496.

Note.—The allotype specimen was preserved in spirit when received, and was consequently somewhat bleached. This discolouration has become more pronounced with drying.

Egg.—Long, 7 mm.; broad, 4·5 mm.; shape somewhat irregular, with a rim of imbricated plates projecting outward around the apical plug; apical plug rounded, wider than long, with a marked convex depression at the apex; colour brown shading to grey, the whole surface finely granulated and closely resembling the texture of bark.

DESCRIPTIONS OF NEW ASTEROIDEA FROM THE PACIFIC.

By

ARTHUR A. LIVINGSTONE

(Assistant Zoologist, The Australian Museum.)

(Plates xxvii-xxviii.)

Among the specimens recently acquired by the Australian Museum the following have been considered to be species new to science and are described in this contribution.

Calliaster erucaradiatus[1] sp. nov.

(Plate xxvii.)

Description.—R. = 34 mm., r. = 12 mm.; R. = 2·8 r. Br. (from middle of one interbrachial to middle of another), 13 mm.; at middle of ray and between superomarginals, 5·5 mm.; between antepenultimate and penultimate superomarginals, 4 mm.

Disk relatively small, slightly elevated along radii. The rays taper gradually and evenly to a blunt tip. Abactinal surface covered by moderately sized plates of varying dimensions. Most of these plates are swollen and each carries either a single fairly long and robust spine (3 mm. high) or a nipple-like boss. The remaining plates of the abactinal surface are flat and unarmed, and most of them border the superomarginal plates. All plates of the abactinal surface are separated from one another by a single encircling belt of squarish and rectangular, flat-topped granules.

The papular pores are fairly numerous and occur singly between the plates on both actinal and abactinal surfaces.

The circular dome-like madreporite is small, but not inconspicuous. It is situated in the interradial region in a position closer to the inner edges of the superomarginals than to the centre of the disk.

Eight superomarginal plates occur on each side of each ray, counting from the centre of the interbrachial arc. Each superomarginal is moderately swollen, smooth and separated from its neighbours by a single encircling belt of squarish and roundly-rectangular, flat-topped granules, smaller than those separating plates on the disk. All superomarginals, with the exception of the first and second, meet across the ray. The first superomarginal (adjoining the interradial line) in every instance carries two, usually fairly long, spinelets (up to 3 mm. high). One is placed on the outer edge of the plate pointing outwards and slightly upwards. The other is situated on the inner edge of the plate and points directly upwards. The second superomarginal (with an occasional exception, when only a small nipple-like boss occurs) carries a single centrally-placed spinelet (about 3 millimetres tall), which is directed upwards and slightly outwards. The third superomarginal plate is armed with a similar spinelet, which is placed outwards from a central position and directed further outwards from the vertical plane than the spinelet of the previous plate. The fourth, fifth and sixth superomarginals are also armed with a spinelet, but its direction

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[1]In reference to the likeness of the rays to certain Australian caterpillars.

gradually drops with each successive plate to a nearly horizontal position. The penultimate and ultimate superomarginals are destitute of spinelets. The terminal plate, which is roundly rectangular, is large and robust. Two spinelets, arranged fork-like, and directed outwards and upwards, spring from the distal extremity of this plate.

The inferomarginal plates correspond in number and position to the superomarginals. The first inferomarginal (counting from interradial line) carries a single outwardly-directed spinelet, except in one instance when it is represented by a nipple-like boss. The second inferomarginal may carry either one or two spinelets. When one spinelet occurs it is directed straight outwards. When two are found, one is directed straight outwards and the other, which is lower down and a little to one side, is directed obliquely downwards. The third, fourth and fifth inferomarginals are similarly armed with one or two spinelets. The sixth, seventh and ultimate inferomarginals, without exception, carry a single slightly downwardly directed spinelet.

Actinolateral plates are wanting beyond the second inferomarginal. The first series (adjoining adambulacrals) reach only to the second inferomarginal. The remaining actionlateral plates in each interradial area are three in number and are arranged to form a triangle. All actinolaterals are slightly swollen and smooth. Most are armed with a centrally-placed, upright and well-developed spinelet. Every one is separated from its neighbours by a single belt of loosely packed, squarish, flat-topped granules.

The adambulacral plates, which reach to the tip of the ray, are roundly rectangular near the mouth, but gradually become round as the tip of the ray is approached. A comb of six to seven spinelets of almost even length spring from the inner border of each adambulacral. From the surface of each adambulacral, within the first three-quarters of the ray, spring two fairly long and stout upright spinelets, arranged one behind the other. Adambulacrals within the last quarter of the ray have only one spinelet and a nipple-like boss on their upper surfaces.

Affinities.—*Calliaster erucaradiatus* is allied to *C. elegans* Döderlein[2], but the presence of pedicellaria, the low, wide inferomarginals, and the spinulation of them as well as the spinulation of the first superomarginals in this latter species, are characters in themselves sufficient instantly to separate these two species.

Locality.—About 11 miles off Crowdy Head, New South Wales, bearing N. by W.; 50 fathoms. Presented Captain K. Möller, trawler "Ben Bow," September, 1935. One specimen, the holotype. Australian Museum Reg. No. J. 5996.

Neoferdina insolita sp. nov.

(Pl. xxviii, figs. 2, 4 and 6.)

Description.—R. = 20 mm.; r. = 6·5 mm.; R. = 3·07 r. Disk and rays flat, except for madreporite and anus, both of which are elevated and conspicuous against the surrounding flatness. The interbrachial arcs are moderately acute. The flat plates of the abactinal surface vary in size up to 2 mm., and all (except where definite abrasion has occurred) are covered by a very fine granulation. The granules are

[2] Döderlein.—Bijdr. tot de Dierk., Amsterdam, xxii, 1922, p. 49, pl. i, figs. 1, 1a–1b.

slightly larger between the plates and around the papular pores than on the plates themselves. Abactinal plates irregularly arranged, except along the midradial lines, where they are, within the basal half of each ray, placed in some semblance of order. Two to three transverse series of granulated plates, which are almost imperceptibly swollen, occur on each ray. In all instances these transverse series of plates begin and end between superomarginals. Superomarginals eight in number on each side of each ray. Most are arranged in a regular manner, but in a few cases a small intervening plate occurs which tends to separate the large superomarginals. The intervening plates or spaces recalls to mind the species *N. ocellata* (H.L.C.). The first superomarginal is of the same size as, or perhaps slightly smaller than, its fellows, all of which proceed towards the terminal plate without any appreciable alteration in size. Superomarginals slightly swollen—not noticeably so. They are bare, except for an encircling basal belt of minute granules which arises from the general granulation. The rounded and bare terminal plate is fairly well developed, bigger than any ultimate superomarginal and destitute of covering or ornamentation. Papular pores conspicuous, isolated, irregularly arranged and surrounded by relatively coarse and loosely packed granules.

Inferomarginals ten in number, clearly defined. All are bare, except for a basal belt of fine granules. Most are more or less of even dimensions, but towards the tip of the ray they become gradually rounder, somewhat swollen and surmounted by a nipple-like boss or rounded eminence.

Adambulacral plates numerous, small and roughly square in shape. Each carries two (rarely three) furrow spinelets, which are short and blunt and only faintly flattened. The general granulation of the actinal surface extends up the furrow spinelets for about half their length, thus webbing them basally.

The first series of actinal intermediate plates extends at least to the antepenultimate inferomarginal. The second series ends between the fourth and fifth inferomarginal. A third and last series does not extend beyond the fourth inferomarginal. All three series are almost perfectly arranged. Actinolaterals on the disk are flat, but as they approach outwards along the rays they become increasingly swollen or elevated. All are covered by dense fine granules, which are larger near the edges of and between the plates. No pedicellariæ. No actinal or intermarginal papular pores. No record of colour in life.

Locality.—On coral reef at Samarai, Papua. Collected by Mr. M. Ward. One specimen, the holotype, Austr. Museum Reg. No. J. 5775.

Affinities.—*Neoferdina insolita* was first thought to be probably a juvenile example of *N. ocellata* (H.L.C.), but, apart from other differences, the first superomarginal in this latter species is so unique in its relative size that one could only doubt the early belief. The only possible course has been adopted and a new species erected. However, as our knowledge of these obscure species advances, there is always the possibility that these two species may be united, but from the data available no such course could reasonably be contemplated. It further differs from *N. ocellata* and also *N. cumingii* (Gray) in having narrower rays and no median radial series of bare plates on the abactinal surface. *N. insolita* differs from *N. glyptodisca* (Fisher) and *N. intermedia* (Djakonov) in having no bare abactinal plates (marginals excepted), and in having smaller and comparatively little variation in the relative size of the abactinal plates.

Ophidiaster watsoni[3] sp. nov.

(Pl. xxviii, figs. 1, 3, 5, 7.)

Description.—R. = 50 mm. (allowing 4 mm. for the slight upward curl of the tips of the rays); r. = 9 mm.; R. = 5·5 r. Br. at base of ray, 10·5 mm. Disk small, raised centrally and radially, slightly depressed interradially in a dry specimen. Rays of approximately equal length, cylindrical, except for a flattened actinal surface. They taper gradually from the disk to a fairly narrow tip. Whole skeleton of the animal covered by a cloak of minute granules, closely packed everywhere except around the papular pores, where they are loosely arranged.

The plates of the abactinal surface, although not strictly in regular longitudinal series, present a degree of orderly arrangement sufficient to warrant the placing of the species in *Ophidiaster*. Many abactinal plates are arranged cone-like above their neighbours and present some definite arrangement. All such plates are of even height and size, and are surmounted by a bare, rounded, nipple-like boss. Three conical plates surround a centrally placed anus. Three others occur at the base of each ray arranged in a mid-radial line. From here outwards towards the tip of the ray the conical plates form two definite longitudinal series, which are separated by the mid-radial line. The plates of both series are arranged alternately in a zig-zag fashion. All other plates of the abactinal surface are fairly small, slightly swollen, and of uneven size. The slight irregularity in the arrangement of the abactinal plates has caused the papular pores to become somewhat uneven also. Nevertheless, eight definite longitudinal rows can be detected within the basal half of the ray. One to five pores occur to each papular area. In the distal half of the ray the papular pores are inclined to occur singly, especially so near the tip. Papular pores are confined to the abactinal surface.

Superomarginal plates twenty-two to twenty-eight in number. They are arranged in regular order, and only occasionally slightly displaced; occurring alternately large and small, every large plate being elevated cone-like and surmounted by a round, blunt, nipple-like boss as seen on some abactinal plates.

Inferomarginals twenty-two to twenty-six in number. All are moderately swollen and regularly arranged. One to three enlarged granules occur on the summit of each plate, except in the cases of the ultimate, penultimate, and antepenultimate, each of which carries a centrally placed spiniform granule.

Between the marginal series a belt of usually sixteen to eighteen moderately sized and unadorned plates occurs. This intervening series commences at the base of the ray and terminates at a point about midway along the ray.

The single madreporite is small and not readily visible. It is flat and irregularly striated by shallow channels.

Adambulacral armature in two series. Each adambulacral plate carries a furrow comb of from two to four (usually three) somewhat flattened and wedge-shaped spinelets, which are from three to four times higher than broad. The subambulacral spines are stout, round and bluntly pointed; they are almost as high as the furrow series. These spines are arranged two to three to a plate (usually three), one being always smaller than the other two. Behind the subambulacral series there are a few enlarged granules. The adambulacral plates come to lie next to the inferomarginal

[3] Named after Mr. Eric Watson, of Sydney, who found the specimen while touring the Great Barrier Reef.

series outwards from a point between the second and third inferomarginal, thus leaving very few actinolateral plates. The interradial line separates an inner pair and an outer chevron of five or six of these latter plates.

Colour in Life.—Ground colour of abactinal surface a pastel brownish-purple, conspicuously darker on apices of tubercles. Bases of tubercles clearly ringed by a band of deep chocolate brown. Colour of actinal surface not recorded.

Locality.—Bushy Island (a coral cay), about 40 miles off Mackay, Queensland. Found on edge of coral reef at low tide. Collected by Mr. E. Watson, July, 1935. Single specimen, the holotype, Austr. Museum Reg. No. J. 5997.

Affinities.—The differences between *O. watsoni* and *O. armatus* Koehler are clearly obvious. *O. watsoni* differs from *Tamaria hirsuta* Koehler (apart from the number of papular series) in having no spine-like tubercles in the inferomarginals, in the degree of the tapering of the rays, and in having the plates of the abactinal surface more irregularly arranged. The intermarginal series within, or just beyond, the basal half of the ray, as well as the character of the spinulation of the adambulacral plates in *O. watsoni*, also afford good distinguishing characters.

Remarks.—With the identification of this species arises once again the vexed question of the lines of demarcation between *Ophidiaster* and *Tamaria*[4]. Here is further evidence that must be weighed when the question is reviewed in the future. There can be little doubt that at least *T. hirsuta*, *O. armatus* and *O. watsoni* are congeneric, and to keep them separated on the now doubtful character of the number of papular series seems unwarranted.

EXPLANATION TO PLATES.

Plate XXVII.

Fig. 1.—*Calliaster erucaradiatus* Livingstone. Side view of holotype. Slightly over natural size.

Fig. 2.—*Calliaster erucaradiatus* Livingstone. Section of actinal surface showing adambulacral plates and furrow spines of holotype. X 3.

Fig. 3.—*Calliaster erucaradiatus* Livingstone. Disk and inner superomarginals of holotype. X 3.

Fig. 4.—*Calliaster erucaradiatus* Livingstone. Actinal surface of holotype. Slightly over natural size.

Fig. 5.—*Calliaster erucaradiatus* Livingstone. Abactinal surface of holotype. Slightly over natural size.

Plate XXVIII.

Fig. 1.—*Ophidiaster watsoni* Livingstone. Enlarged section of actinal surface of holotype. Approx. X 3.

Fig. 2.—*Neoferdina insolita* Livingstone. Actinal surface of holotype. Approx. X 1½.

Fig. 3.—*Ophidiaster watsoni* Livingstone. Portion of actinal surface of holotype. Slightly over natural size.

Fig. 4.—*Neoferdina insolita* Livingstone. Abactinal surface of holotype. Approx. X 1½.

Fig. 5.—*Ophidiaster watsoni* Livingstone. Abactinal surface of holotype. Slightly under natural size.

Fig. 6.—*Neoferdina insolita* Livingstone. Enlarged section of abactinal surface of holotype. Slightly under X 3.

Fig. 7.—*Ophidiaster watsoni* Livingstone. Side view of holotype, showing the intermargina series of plates.

[4] Livingstone, Brit. Mus. (N.H.) Sci. Reports, Great Barrier Reef Exped., 1928–29, iv, 8 Asteroidea, 1932, p. 261.

A NEW TREE-KANGAROO FROM SOUTH-EASTERN PAPUA.

By E. Le G. Troughton, C.M.Z.S., and A. S. Le Souef, C.M.Z.S.

The female *Dendrolagus* described below, which was received at Taronga Zoological Park in 1935 through the courteous efforts of Mr. O. J. Atkinson, provides what appears to be the south-easternmost Papuan record for the genus, and apparently represents a new pale-faced, drabby brown form of the *dorianus* group. When immature the animal was of an even dark-brown colour, but has since developed a strikingly pallid facial coloration in contrast with the dark muzzle, ears, and drabby brown body.

As the present coloration is evidently characteristic of the adult female pelage, and the well-conditioned animal may survive for a considerable time, it seems advisable to make the form known by a preliminary description of the external features, awaiting examination of cranial and dental characters before settling the question of specific status.

The discovery of yet another form of this interesting group of the genus, in addition to the two-colour phases, figured in their splendid review of "The Genus *Dendrolagus*," by Lord Rothschild and Captain Guy Dollman[1], emphasizes the point stressed in our recent paper[2], describing two new species, that the high mountain and river systems of New Guinea have favoured the development of a surprising number of confusingly varied and inter-related races of the several species of tree-kangaroos.

Owing to the remarkably specialized habits of the animals, races and species appear to develop in closer proximity than do those of purely terrestrial genera. Unfortunately, however, very little cranial differentiation is shown by various forms over a considerable geographical range, while occasional extremes of local colour variation make it difficult to isolate and stabilise what may actually be fixed geographical races.

The desirability of dealing with the new south-eastern race is further indicated by the fact that the pale-headed animal figured by Rothschild and Dollman as the true *D. dorianus dorianus* does not represent the typical male or female, according to comparison with the co-types in the Macleay Museum, and the series, including topotypes, in the Australian Museum. On the contrary, the rich coloration of the female phase figured as *dorianus* ab. loc. *aurea* from the same faunal area as the typical *dorianus*, though brighter, is quite in keeping with the female co-type. Indeed, except for lacking the paler crown the coloration of the head accords far more with that of the co-types of both sexes than does the head of the animal figured as typical *dorianus*. Unfortunately, neither the locality or sex of the latter is indicated by Rothschild and Dollman, but as the animal is shown to lack the dark to blackish-brown muzzle and ears of the typical and other forms of the group, and the face is paler than the typical *dorianus*, the new name of *palliceps* is now applied to the colour form

[1] Rothschild and Dollman.—Trans. Zool. Soc., xxi, 6, 1936, pp. 477–502, pls. xxxv–lvii. Our copy by courtesy of Mr. Melbourne Ward, F.Z.S.

[2] Troughton and Le Souef.—Australian Zoologist, viii, 3, 1936, pp. 193–7.

figured on plate xxxix. Though doubtless a purely local phase, or sex aberration, comparable to and possibly associated with *aurea*, the name will serve to distinguish it from the pale-crowned more drabby brown animal described below, which was taken some 150 miles south-east from the typical habitat of the species.

Dendrolagus dorianus profugus subsp. nov.

Diagnosis.—A drabby brown animal with the pallid crown and facial area strongly contrasting with the blackish brown muzzle and ears and general drab coloration, and thus distinguished from the typical race in which the crown is merely a lighter grizzled tone of the body coloration. Rhinarium also differing, naked except in centre line, instead of being sparsely but evenly haired. Habitat: Inland towards Mt. Simpson, from Boianai, which is near Radava, at the eastern end of Goodenough Bay, North-eastern Division of Papua.

Description.—Form and limbs stout and face broadly rounded, the effect increased by the long upstanding fur, which renders the rump-whorl rather indistinct; fur measuring about 30 mm. in middle of back. General colour of back drabby to hair brown grizzled with the lighter buffy and dark brown hair-tips, lacking the warm to ochraceous buff (Ridgway) tones of true *dorianus*, but having a wash of dark russet around the rump and tail-base. Throat, chest, and centre of belly paler buffy to yellowish brown, but the sides not contrasting markedly. Basal part of fur above and below not distinctly paler than the outer half but toning imperceptibly with the tips, some of which are actually lighter. Dorsal stripe dark brown, rather faintly defined but continuous from the rump to between the ears. Crown ashy or cinereus grey from eyes to ears and merging into the buffy to pale fulvous grey cheeks, the pallid facial area contrasting strongly with the dark to blackish brown ears and muzzle, as does the dark chin with the buffy throat. Rhinarium naked except for slight hairing in the centre line, instead of being completely hairy as in typical *dorianus*. Fore and hind limbs paler than in *dorianus*, especially the manus, which is grizzled grey instead of blackish brown. Small, rounded, pale buffy rump spot not extending around base or along tail as a stripe. Tail almost equalling the head and body length in the live animal, coarse-haired and brush-like, dark to blackish brown in outer half, with some pale buffy hairs at the tip, but entire tail lacking the admixture of shining ochraceous buff hairs of typical *dorianus* tails, which tend to form a light tip.

Dimensions.—Alive: Head and body about 600; tail 565; pes 108; ear about 45 mm.

Holotype.—Young adult female received at Taronga Zoological Park in 1935 from Denewa; altitude 3–4,000 feet, inland towards Mt. Simpson from Boianai, which is near Radava, at the eastern end of Goodenough Bay, North-eastern Division of Papua. Specimen eventually to be lodged in the Australian Museum.

Remarks.—It must be stressed in distinguishing this race that the somewhat lighter crown of normal *dorianus* tones, rather than contrasts, with the general coloration, the entire head not being pale as figured for the typical animal by Rothschild and Dollman, the muzzle actually being dark brown almost to the eyes, while the ears also are much darker than shown. The keynote of Ramsay's description was uniformity, the general coloration being given as uniform dark brown "all over," so that the succeeding "on the head . . . paler than on the body" evidently meant that the head toned rather than contrasted with the body.

A somewhat confusing point also was that Ramsay referred to the " muffle " as blackish, as if only the rhinarium was dark-coloured, but his use of the term " whiskers " indicates the blackish-brown colour of the muzzle as well. Therefore, condensation of the original description by Thomas, " Head short-haired, paler than the body " in the " Catalogue " is misleading, apart from the original context, and may have prompted selection of an entirely pale-headed animal as the typical form.

The drab coloration and dense upstanding coat of the new race are apparently indicative of its high and possibly more exposed habitat on the opposite coast, about 150 miles south-east of the type locality of *dorianus*. It is evidently closely related to the typical form, but, pending examination of the cranial and dental features, may certainly be regarded as subspecifically distinguishable from any known phase of the *dorianus* group.

The race is distinguished from the more northern and north-western examples of the species by the drab brown general colour, and the cinereus crown, which strongly contrasts with it and the dark nose and ears, extension of the dorsal stripe onto the nape, and the notably less hairy rhinarium. The sombre general coloration of the female, in a species having that sex usually brighter coloured, indicates that males of the new race may be of an even more drabby tone, and thus further emphasise its distinctness.

MYSTICONCHA, A NEW GENERIC NAME FOR *CALEDONIELLA* BASEDOW, *NON* SOUVERBIE.

By

JOYCE ALLAN,

Assistant Conchologist, The Australian Museum.

(Plates xxv-xxvi and Figure 1.)

The presentation recently to the Australian Museum collection of a mollusc trawled off Cape Everard, Victoria, by Captain K. Moller, a keen collector who has given much valuable material to the museum, has disclosed some interesting facts concerning the generic and specific name of a similar species from Backstairs Passage, St Vincent Gulf, South Australia.

Basedow[1] gives the new specific name *contusiformis* (Pl. xxvi, figs. 6–9) and colour variety names *testudinis*, *pulchra*, and *labyrinthina* to a large naked mollusc dredged in South Australia, and places it in the genus *Caledoniella* Souverbie[2], a genus made for a small, snail-like, parasitic mollusc from New Caledonia, described as fragile, with fine radiating striæ, and covered with a fine yellow epidermis. Later, from a further note[3], we learn that two examples of this mollusc were sent from New Caledonia by Montrouzier, with a simple note attached to the first that it was found living parasitic between the thoracic legs of a *Gonodactylus* ("Trouvée vivante entre les pattes thoraciques d'un Gonodactyle"), a marine crustacean. The most important characters of this species were that it was a parasitic form, it possessed an epidermis, was depressed oval-orbiculate in shape, and was only 5-7 mm. in diameter and 4 mm. high, with an aperture $4\frac{1}{4}$ mm. wide and $3\frac{1}{4}$ mm. high. In order that this interesting species should have a place in nomenclature, Souverbie gave to it the name *Caledoniella montrouzieri* (Pl. xxvi, fig. 3), but the disposition of it in a family he left to later authors. Tryon[4] placed it in the family Naticidae, but Fischer[5] had previously placed it in the family Lamellariidae, where it still remains.

It is apparent from the description of this shell and its parasitic habit that Basedow very erroneously placed his species in the genus *Caledoniella*. It can only be surmised that he could not have seen the later note on it or the figures, otherwise he would have realised how very dissimilar the two molluscs are. The most outstanding external character is that Basedow's species is a naked mollusc, a large, soft animal, and only on dissecting it along the dorsal surface is a thin large shell found, completely enclosed by the dorsal skin or mantle of the animal. The species *Caledoniella montrouzieri*, on the other hand, is founded on a shell which is definitely external. The animal, which must have been known to Montrouzier, since the specimens were found in their live state, was disregarded in both descriptions of the shell. A mollusc possessing a completely internal shell cannot be the same genus as one having a wholly external shell which envelops a small animal. Basedow's own excellent drawings of his species and its internal shell, apart from his good description, quickly show their dissimilarity.

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[1]Basedow, Trans. R. Soc. S. Austr., xxix, 1905, p. 181–5, pls. xxviii–xxix.
[2]Souverbie, Journ. de Conch., xvii, 1869, p. 421.
[3]Souverbie and Montrouzier, Journ. de Conch., xviii, 1870, p. 71–2, pl. ix, fig. 4.
[4]Tryon, Man. of Conch., viii, 1886, p. 12.
[5]Fischer, Man. de Conch., 1885, p. 764.

It has for some time been my habit when an interesting specimen comes to the conchological department of the museum to make a quick sketch of it for later reference, especially if it is a specimen likely to suffer through preservation, and I have found this most useful, especially in the case of nudibranchs. A few years ago a specimen of *Gonodactylus* (Pl. xxvi, fig. 1), collected by Mr. Melbourne Ward, came with other material from Albany Passage, Cape York, Queensland, and as this was found to have some small shells living parasitically on the ventral surface between the legs, I made some rough sketches, which have been until now with papers belonging to the Conchologist, Mr. T. Iredale. From these drawings it can be seen that the shell belongs to the same genus *Caledoniella* as Souverbie's New Caledonian specimens, which makes it more apparent still that Basedow's one does not belong to it. The Queensland species, from its size and general appearance, is probably the same as *Caledoniella montrouzieri*, but the examination of that can be left for another occasion.

It is necessary, therefore, to create a new genus for the species named by Basedow, *Caledoniella contusiformis*, and varieties *testudinis*, *pulchra* and *labyrinthina*. Cotton and Godfrey[6] raise these to specific rank, but I think they are better left as colour varieties (as Basedow suggested), and so I propose the generic name *Mysticoncha* for the species.

As to the specific name of this species, further difficulty arises. Basedow[7] mentions that E. A. Smith[8] has described a new species of mollusc dredged in Port Phillip Bay, closely allied to his species, but does not consider it a fair criterion to make comparison from the description of this, which is from a contracted specimen. On reading the description of Smith's species, *Lamellaria wilsoni* (Pl. xxvi, fig. 5), however, I consider that it agrees with Basedow's species sufficiently, and, considering the locality, strongly enough to be the same, therefore making *Caledoniella contusiformis* Basedow, with its three varieties, *testudinis*, *pulchra* and *labyrinthina*, synonomous with *Lamellaria wilsoni* Smith, an earlier species. Smith places his species in the genus *Lamellaria* because its shell most resembles that species, but says the dentition more nearly approaches *Marsenina*, but as the drawings accompanying Basedow's description of his species, those in Smith's article, and now those of the shell of the species recently trawled off Cape Everard, show that this mollusc is not of the genus *Lamellaria*, *Caledoniella contusiformis* Basedow now becomes *Mysticoncha wilsoni* Smith.

To go back to the genus *Caledoniella* Souverbie, it is interesting to note here that Preston[9] creates a new genus and species, *Epistethe gonodactyli* (Pl. xxvi, fig. 4), for a small, thin, snail-like shell found living parasitically on the ventral surface of a stomatopod crustacean, *Gonodactylus chiragra*, from the Persian Gulf. As no reference in his account of this species is given to Souverbie's species from New Caledonia, I presume he was unaware of this paper, and thus created a new genus for a species which, from the description and figures he gives, is obviously the same genus as that of Souverbie, and, therefore, *Epistethe* Preston becomes a synonym of *Caledoniella* Souverbie. Two other genera of parasitic shells, *Robillardia* Smith (1889) and *Cochliolepis* Stimpson (1859), though somewhat resembling the others, are

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[6] Cotton and Godfrey, S. Austr. Nat., xiii, Nov., 1931, p. 23.
[7] Basedow, Trans. R. Soc. S. Austr., xxix, 1905, p. 185.
[8] Smith, Ann. Mag. Nat. Hist. (5), xviii, 1886, p. 270, woodcut.
[9] Preston, Rec. Indian Mus., vii, 1912, p. 126–7.

parasitic on different types of animals, the former on *Echinus*, the latter between scales on a certain species of annelid worm. It is doubtful, however, whether these genera, on account of their different hosts, would be the same as those parasitic on *Gonodactylus*.

Family **LAMELLARIIDAE.**

Genus **Mysticoncha,** nov.

Orthotype, *Lamellaria wilsoni* Smith, identified from material trawled off Cape Everard, Victoria.

Animal.—Body ovoid, smooth, dorsal shield or mantle thick, large, verrucose, with the edges tucked in along the sides, and, when contracted, almost completely enclosing the foot. Notched anteriorly, and produced into an imperfect siphon. Head differentiated from the rest, eyes distinct, blue-black, placed on prominences on the outer bases of the tentacles, which are tapering and flattish-cylindrial. Foot truncated, horizontally slit anteriorly, and dilated into wing-like expansions, the slit continuing well down them. Mandibles strong and corneous. Radula long, narrow and ribbon-like, dentition 2.1.1.1.2.

Shell.—Shell completely internal, thin, large, globose, spire small, few-whorled, body whorl large, whitish-buff coloured.

Hab.—South Australia and Victoria.

Thiele [10] places *Caledoniella* Souverbie in the family *Lamellariidæ*, but on the description of Basedow's animal and shell, and it certainly seems that *Mysticoncha* (*Caledoniella* Basedow) is more correctly placed in this family than is *Caledoniella* Souverbie.

Mysticoncha wilsoni (Smith).

(Pl. xxv.)

Lamellaria wilsoni Smith, Ann. Mag. Nat. Hist. (5), xviii, 1886, p. 270 and fig. Port Phillip Bay, South Australia (*i.e.*, Victoria). Holotype in British Museum.

Caledoniella contusiformis Basedow, Trans. Roy. Soc. S. Austr., xxix, 1905, p. 183, pl. xxviii, fig. 1, and pl. xxix, fig. 1–8. Backstairs Passage, St. Vincent Gulf, South Australia, 25 fathoms.

C. contusiformis vars. *testudinis*, *pulchra*, and *labyrinthina* Basedow, *ibid.* p. 185, pl. xxviii, fig. 2–4, St. Vincent Gulf, South Australia.

Animal.—Large and almost pleurobranch-like in appearance, mantle thick and fleshy, smooth, devoid of any pustulation or granulation, and much larger than foot. Body arched and sides tucked in round the foot, and almost closing over it. Between the mantle and foot is a distinct head, with a long tapering tentacle on each side, each bearing a blue-black eye on the outer side of a basal prominence. The mouth is large and rounded. The foot is small in comparison with the size of the animal, is broad anteriorly and bluntly pointed posteriorly. At the anterior end the sides are dilated into wing-like expansions, the horizontal slit at this end extending

10 Thiele, Handb. der Syst. Weicht., Jena, 1929, p. 265.

well down these expansions. Gill very small in the specimen examined, and could only be seen by forcing back the mantle margin. The gill was situated on the dorsal part of the animal, just behind the head, and extended from there round to the right side of the foot, terminating just about where the foot became free. It seemed to be attached for most of its length. On dissecting the specimen for the radula and jaws, the buccal cavity was found to contain a mass of orange-coloured pulp, probably food in the process of digestion. The jaws are very large, horny, almost tan coloured, flat, the convex side of each part heavily serrated with about twelve large serrations and a few smaller ones. A strong ridge run from each serration to the concave side, and each platelet thus formed shows fine oblique lines on it. They are 8 mm. long and 4 mm. broad. The radula is long and ribbon-like, with about 92 rows of large, conspicuous teeth, making strong ridges down the ribbon. The teeth are glassy, and the arrangement of the dentition is 2.1.1.1.2. The central tooth is subquanrangular and serrated, and the marginals narrower than the laterals. Length of radula, 25 mm.; breadth, 2 mm. The specimen was a female, with the generative opening on the right side behind the tentacle, but further dissection of it was not deemed advisable as only one specimen had been collected and this was in a rather contracted state.

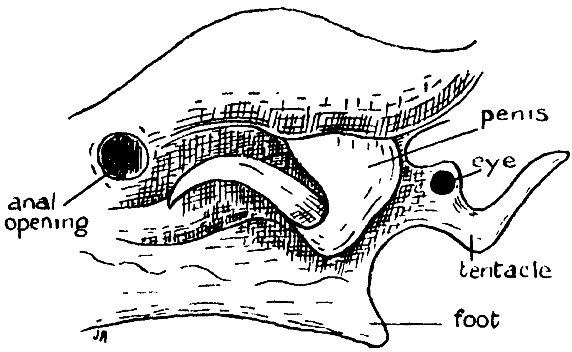
Although the animal was very contracted through preservation, most of the colour marking was distinct and easily seen. The ground colour of the animal was yellowish-white, but probably was brighter in life. On the dorsal surface were broad conspicuous brown-black lines which irregularly connected up forming roughly five or six sided areas inside which were very large rounded blotches of the same colour. Sometimes a complete circle of the dark colour also enclosed the spot and some of the areas had within them as well as the blotches and rings, minute dashes of the dark colour. The marking was outstandingly conspicuous. Owing to the sides of the dorsal surface being curled in round the foot it was impossible to see what colour its undersurface was or whether it had similar markings. The foot, however was uniform bright orange-red, only the tips of the tentacles and the edges of the dilated part of the foot being black. In its contracted state, the animal measured 50 mm. by 40 mm. and was about 40 mm. high.

Shell.—The large globose shell was entirely internal, but could be removed easily by dissecting practically along the whole length of the dorsal surface, where it was found occupying almost all this area, and enclosing the spiral-shaped visceral mass of the animal. The shell is very thin, cream coloured, with three small whorls forming the spire, and a very large body whorl. In its natural position the spire seems slightly channeled at the sutures, giving it a depressed appearance; but I noticed that it is possible to force the spire out, making it a more typical one. The outer lip of the body whorl seems to arch to a point where the base of the aperture meets it, but as the shell is so thin the minute it is out of preservative it is liable to crinkle into ridges, and this may be such a one. There are growth lines on the shell, giving it a faintly striated appearance. The texture of the shell is almost similar to that of certain species of *Tethys*, and it is this thin shelly matter, easily rubbed off, which I think, Basedow considered to be epidermis in his specimens. The measurement of the shell is 38 mm. long by 33 mm. wide.

Locality.—Trawled off Cape Everard, Victoria, by Captain K. Moller. Australian Museum Collection, Regd. No. C. 59324.

I consider this specimen identical with Basedow's typical form, and not with any of the three colour varieties, as it most resembles this form in its colour marking.

Since preparing the above description, I have found another specimen of this interesting mollusc in the Museum collection and labelled *Pleurobranch* sp. It was collected in 1904 by the " Endeavour " off Davenport, Tasmania, and is in a fairly good state of preservation. The specimen, though faded, is still a uniform pink colour above and oranged tinged below, and has lost all pattern on the upper surface except the small black spots. In this state, the spots resemble those on Basedow's figure of his variety *testudinis*, but this is possibly due to the original pattern having disappeared, and in general appearance it resembles the Cape Everard specimen. The " Endeavour " specimen is a male, with a large penis extruded from the side of the foot just behind the right eye-bearing tentacle. The penis is broad at the base, tapers towards the end, is flattened, and about one-fourth of an inch long. It is not retracted into an opening, but occurs simply as a surface protrusion. Further along the side of the foot and posterior to the gill is a large, rounded opening—the anal opening. By the addition of this specimen, with its strongly pronounced external penis, to the species, the other specimen of which is a female, establishes the fact that in this type of mollusc the sexes are distinct. Basedow gives no indication of the sex of the specimens he described.



Penis of *Mysticoncha wilsoni* (Smith) from Davenport, Tasmania. Collected by F.I.S. " Endeavour.

EXPLANATION OF PLATES.

Plate XXV.

Mysticoncha wilsoni (Smith).

Fig. 1.—View of the dorsal surface of *Mysticoncha wilsoni*. Trawled off Cape Everard, Victoria.

Fig. 2.—Ventral view of the same.

Fig. 3.—View of the head and anterior end of the foot of *Mysticoncha wilsoni*. Slightly enlarged.

Fig. 4.—Radula of *Mysticoncha wilsoni*. Enlarged.

Fig. 5.—A lateral tooth from the radula.

Fig. 6.—A central tooth from the radula.

Fig. 7.—Two marginal teeth from the radula. All greatly enlarged.

Fig. 8.—The internal shell of *Mysticoncha wilsoni*.

Fig. 9.—The shell exposed *in situ* after a slit has been made in the dorsal part of the mantle sheath.

Fig. 10.—The visceral mass of *Mysticoncha wilsoni* after the shell enclosing it has been removed.

Figs. 11 and 12.—Jaws of *Mysticoncha wilsoni*. Enlarged.

Plate XXVI.

Fig. 1.—A species of Gonodactylus from Queensland, with two parasitic shells of the genus *Caledoniella, in situ.*

Fig. 2.—The parasitic shell enlarged.

Fig. 3.—Two views of *Caledoniella montrouzieri* Souverbie.

Fig. 4.—Two views of *Epistethe gonodactyli* Preston.

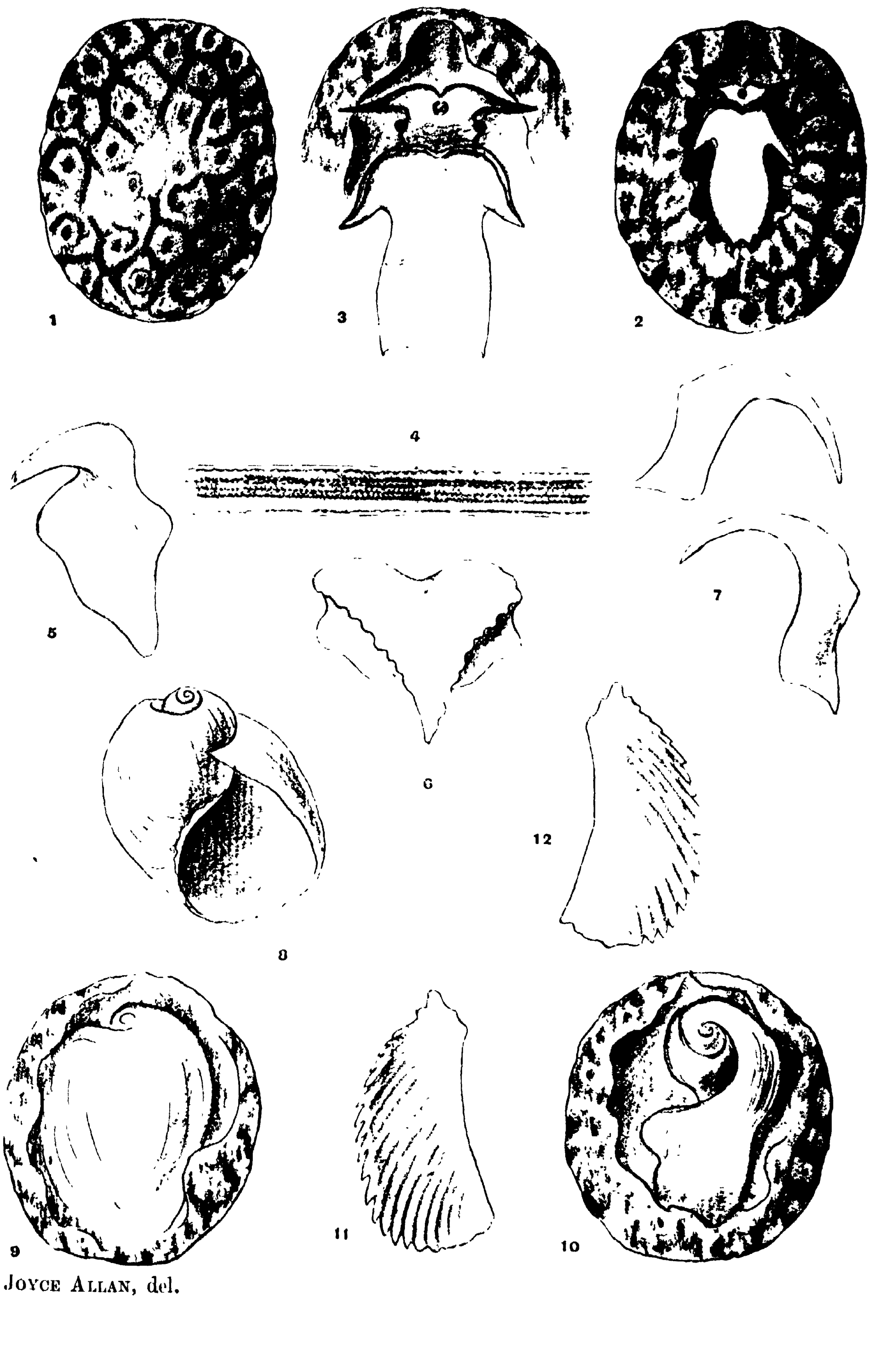
Fig. 5.—The shell and teeth from the radula of *Lamellaria wilsoni* Smith. The original drawing of the shell is about two-thirds its natural size.

Figs. 6 and 7.—Two views of the internal shell of *Caledoniella contusiformis* Basedow.

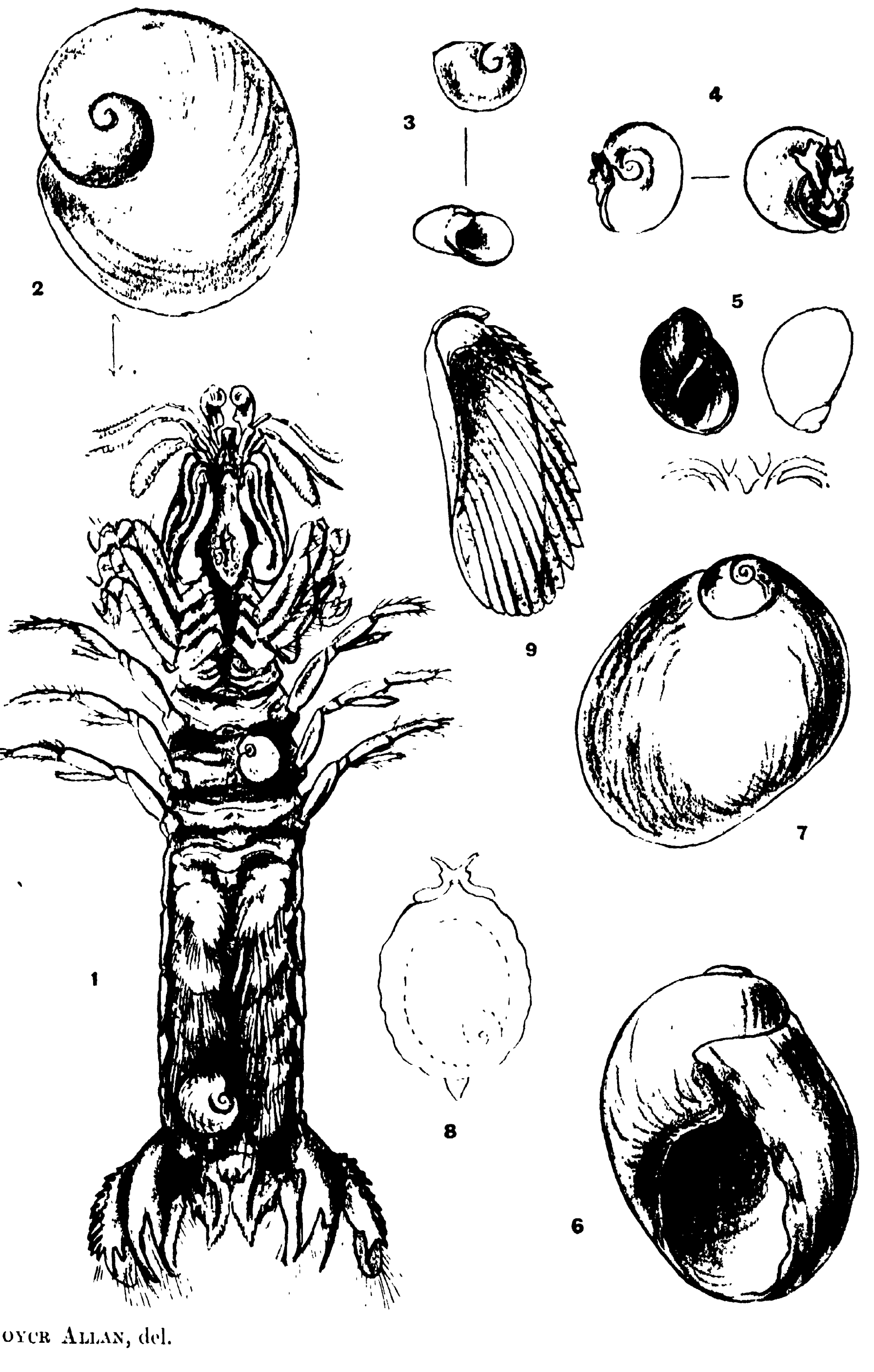
Fig. 8.—*Caledoniella contusiformis* Basedow, showing position of shell in respect to the animal.

Fig. 9.—One part of the jaw or mandible of *Caledoniella contusiformis* Basedow.

Sydney: Alfred James Kent, I.S.O., Government Printer—1936.



JOYCE ALLAN, del.



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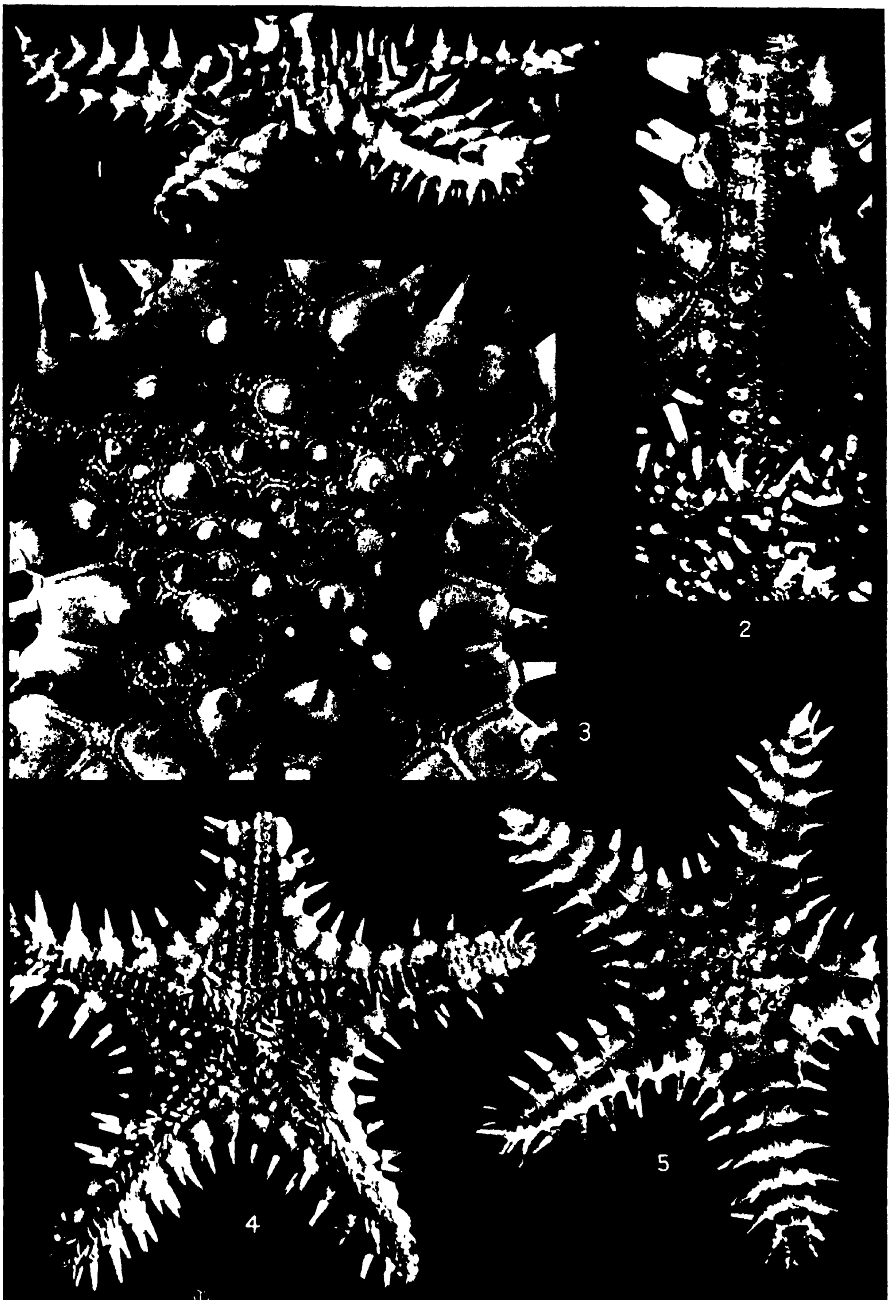
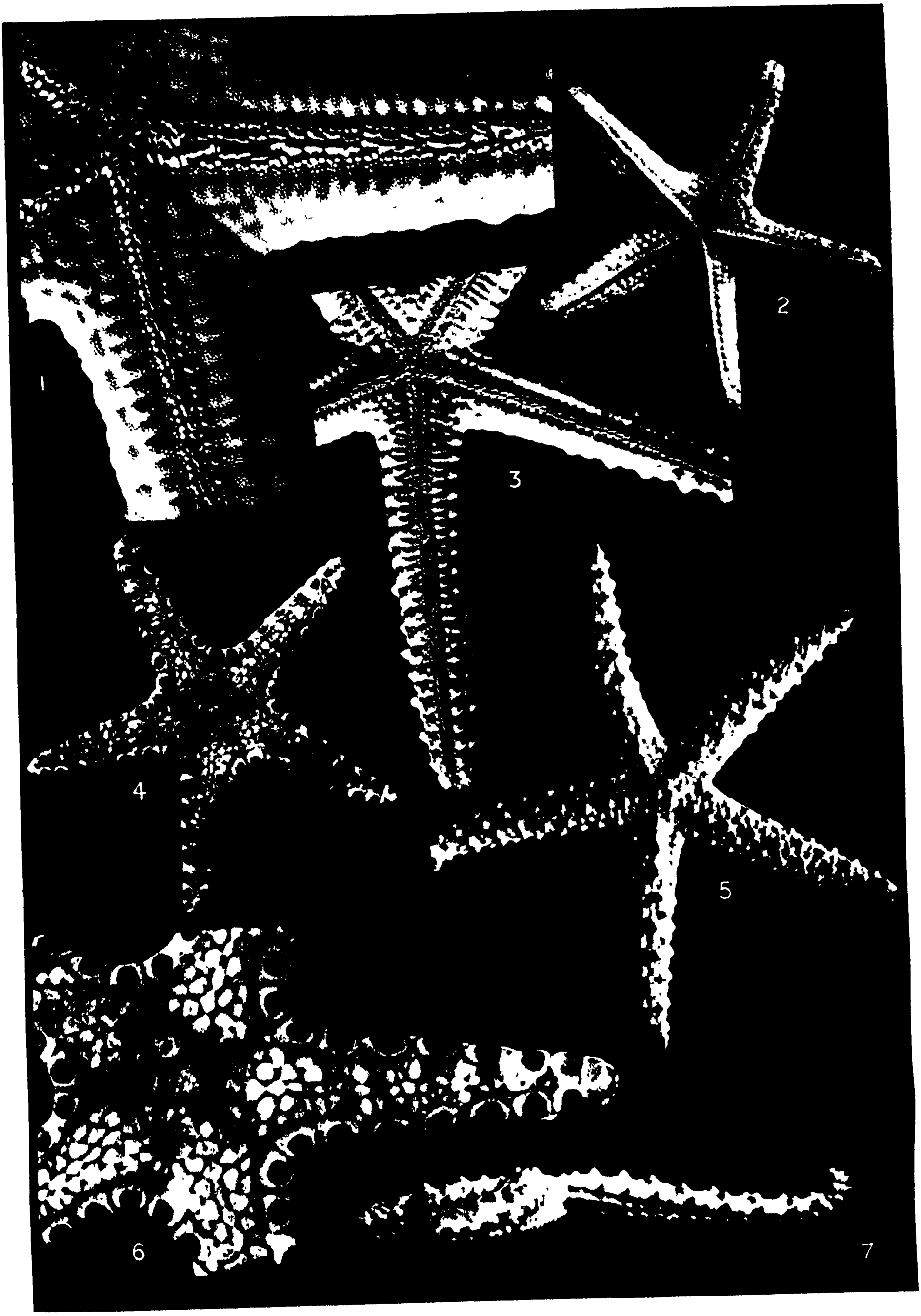


G. C. Clutton, photo.



G. C. CLUTTON, photo

THE FOOD OF TROUT IN NEW SOUTH WALES.

1934-1935.

By Keith C. McKeown

(Assistant Entomologist, the Australian Museum).

This paper contains the results of the investigation into the food of trout in New South Wales carried out during the season 1934–1935, and gives details of the stomach contents of 83 Rainbow Trout (*Salmo irideus* Gibbons), 67 Brown Trout (*Salmo fario* Linnæus), and 8 Loch Leven Trout (*Salmo levenensis* Walker).

The earlier results of this investigation have been presented in two papers[1] which should be consulted by those interested in the conservation of trout.

Considerable interest in the investigation has been evidenced throughout New South Wales, Victoria, and New Zealand. In Victoria the need for, and the economic value of, such an investigation are becoming evident, and it is to be hoped that research will be carried out in other States along these lines.

When the present investigation was commenced no information was available with regard to the food of trout in Australia, although considerable research had been carried out in New Zealand, which was being applied in a practical manner in an endeavour to improve the conditions prevailing in the streams of the Dominion. We now know, subject to climatic and other variation, the principal insects and other animals constituting the food of our trout; this is a step in the right direction, but as the investigation has progressed it has become more and more apparent that the laboratory work must be correlated with field research. A quantitative survey of the principal trout streams is essential for the solution of a number of problems which have presented themselves during the course of the work. We know that certain insects are taken as food by the fish, but we do not know whether other insects, etc. are present in the streams but are distasteful to the trout, nor do we know the relations between those species which have been proved to be of value as fish food. Caddis are present in the streams in varying numbers through the season. At some periods the caddis constitute the most important food item, but they may suddenly decline in numbers in the stomachs, although individual fish may be still taking them in large numbers. At the periods of diminution in numbers of the caddis there is usually an increase in the quantity of terrestrial insects taken, *e.g.*, Scarabæidæ. It is important to discover in this and other cases whether the fish have a preference for the beetles and abandon the caddis in their favour, or whether the change in food is due to some sudden decrease in the number of the caddis. This aspect is apparent in the case of other insects. This is but one problem among many, but the solution can be obtained only by careful research in the field, and definite conclusions of value to the future of the Australian trout streams arrived at by the correlation between laboratory and ecological methods. I feel that this aspect cannot be too strongly stressed.

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[1] McKeown.—Notes on the Food of Trout and Macquarie Perch in New South Wales. Rec. Aust. Mus., xix, 2, (March 26, 1934), pp. 141–152, pl. xvii; The Food of Trout in New South Wales, 1933–1934. Rec. Aus. Mus., xix, 3, (September 28, 1934), pp. 184–213.

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As in the past I am indebted to members of the New South Wales Rod Fishers' Society for their interest and assistance in the course of the work, and especially to Dr. A. J. Spiller Brandon, through whose untiring efforts we possess a more complete record of trout food from the Tuross River than from any other stream. My thanks are also due to Messrs. G. H. Montgomery, A. E. Church, F. W. Barrett, the Rev. W. A. Evans, and the Lithgow Trout Fishermen's Association, for their trouble in collecting material for examination.

It is to be regretted that material was not forthcoming from more districts this season, for there are many streams from which information is highly desirable.

The accompanying figures showing the comparison of the averages per fish of the aquatic and non-aquatic foods consumed by Brown and Rainbow Trout, are of considerable interest, but seem to show that there is little in the contention that the Brown Trout feeds more upon the surface, and consequently secures more water-borne terrestrial insects, etc., than the Rainbow Trout.

Comparison of the Average Number of Insects of each order taken by Rainbow and Brown Trout.

	Aquatic.		Non-Aquatic.	
	Brown.	Rainbow.	Brown.	Rainbow.
Coleoptera	·19	·29	8·64	6·75
Hemiptera	·5	·2	·4	·32
Hymenoptera	...	...	1·31	42·78
Orthoptera	...	...	·13	6·03
Trichoptera	12·56	87·59	...	...
Lepidoptera	...	...	·12	·1
Odonata	1·6	·76	...	...
Ephemeroptera	·47	1·4	...	...
Diptera	...	...	·31	·66
Perlaria	·06	*	...	...
Thysanoptera	...	...	...	·02
Isoptera	...	...	·31	1·6
Archnida	...	...	·1	·14
Vermes	·1	·07	...	...
Mollusca	...	·01	...	...
Amphibia	·06	·14	...	...
Reptilia	...	...	·01	·01
Mammalia	...	...	...	·01
Crustacea	·06	5·8	...	...
	15·6	96·24	11·33	58·42

Tables setting out the monthly distribution of food of Rainbow and Brown Trout for each locality are appended, and should be compared with those given in my previous paper[2].

[2]The Food of Trout in New South Wales, 1933–1934. Rec. Aus. Mus., xix, 3 (September 28, 1934), pp. 184–218.

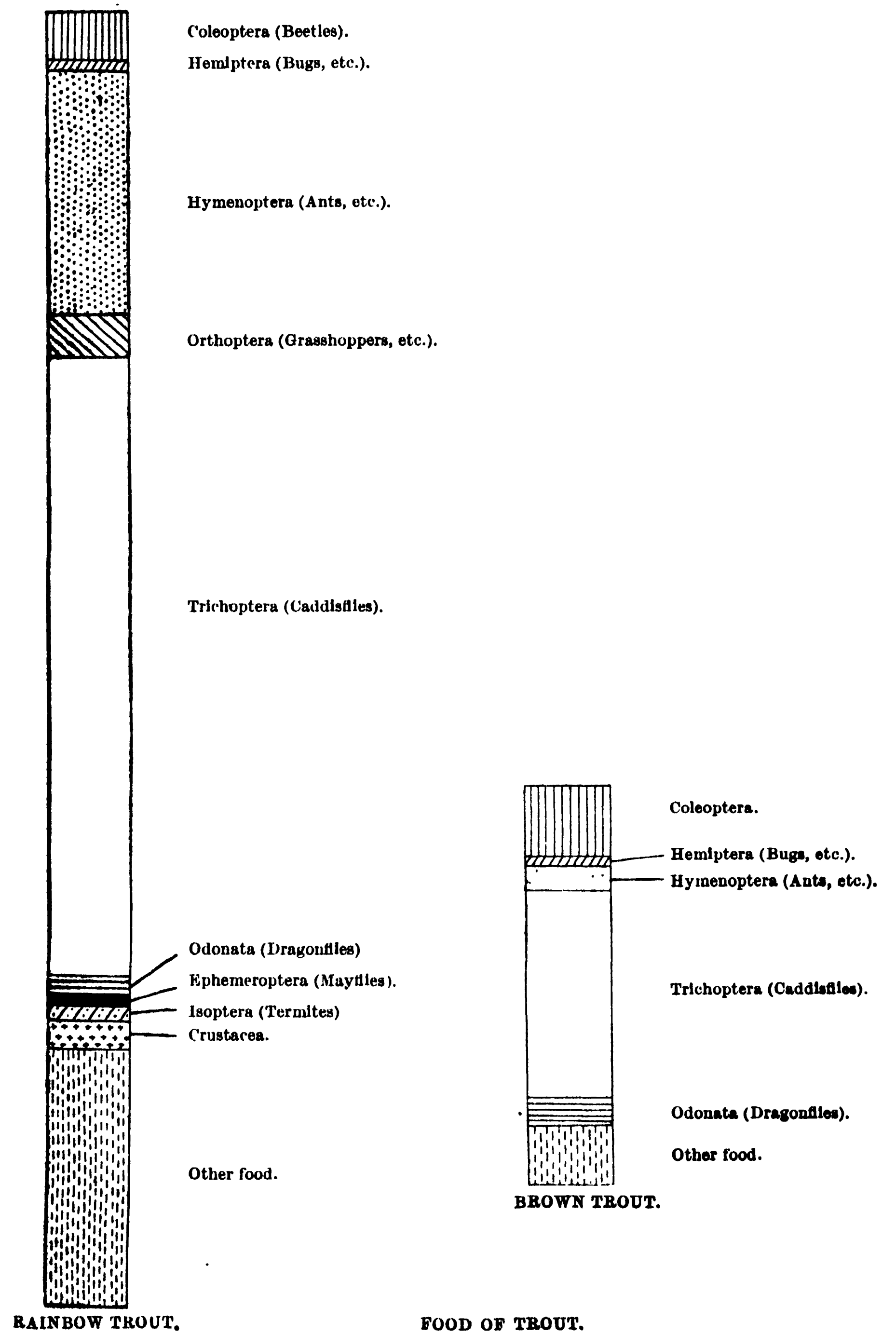
Monthly Comparison of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons).

	December.				January.				February.			
	Duckmaloi River.	Badja River.	Little Manning River.	Tuross River.	Duckmaloi River.	Badja River.	Little Manning River.	Tuross River.	Duckmaloi River.	Badja River.	Little Manning River.	Tuross River.
Stomachs exd.		13		10	1	4		6			12	15
Coleoptera		32		200	3	18		43			39	176
Hemiptera		8		3	...	8		2			5	12
Hymenoptera		5		37	...	22		3			15	3,488
Orthoptera		1		...	...	1		...			4	...
Trichoptera		575		790	...	1,103		64			4,253	114
Lepidoptera		...		1	...	...		1			5	1
Odonata		11		7	...	3		16			6	17
Ephemeroptera		36		14	...	16		2			36	1
Neuroptera		..		..	...	...		...			...	...
Diptera	No data.	..	No data.	3	...	8	No data.	2	No data.	No data.	...	24
Thysanoptera		...		..	...	...		...			...	1
Perlaria		4		...	...	...		...			...	...
Isoptera		..		1	...	...		...			...	136
Miscellaneous Insects		*		*	...	*		*			...	*
Arachnida		2		3	...	...		...			...	2
Vermes		...		1	...	...		...			...	...
Mollusca		..		...	...	..		...			...	...
Amphibia		1		...	...	...		...			...	10
Reptilia		..		...	...	...		...			...	...
Mammalia		...		...	...	...		...			...	...
Crustacea		...		1	...	...		...			...	...

Monthly Comparison of Stomach Contents of Brown Trout (*Salmo fario* Linneaus).

	December.		January.		February	
	Duckmaloi River.	Tuross River.	Duckmaloi River.	Tuross River.	Duckmaloi River.	Tuross River.
Stomachs exd.	15	14		13		17
Coleoptera	62	248		12		
Hemiptera	5	4		17		
Hymenoptera	25	5		47		
Orthoptera	6	1		1		
Trichoptera	24	112		107		574
Lepidoptera	3	1		1		2
Odonata	22	84		20		23
Ephemeroptera	17	4		6		4
Neuroptera	..	...		...		1
Diptera	1	5	No data.	8	No data.	5
Perlaria	...	3		..		1
Isoptera	...	1		20		..
Miscellaneous Insects	*	*		*		*
Arachnida	4	1		1		...
Vermes	1	2		1		3
Amphibia	...	1		2		...
Reptilia	1	...		...		...
Crustacea	...	...		2		2

The accompanying graph sets out the proportions of each of the principal foods taken by Rainbow and Brown Trout, and is based on an average of the contents of all stomachs examined during the period 1931 to 1935. Although the basis of computation, *i.e.*, that of the number of individuals of each class consumed, is not wholly satisfactory, yet it presents the numerical proportions of these foods in a striking manner.



FOOD OF TROUT.

A number of orders were eaten in such small quantities that it is impossible to show them on a graph of this scale, and it has been necessary to combine them under the section "Other food."

A most striking feature emphasised by the graph is the small amount of food consumed by the average Brown Trout in comparison with that eaten by the average Rainbow Trout. This factor has been strongly in evidence throughout the investigation.

The following notes are of value as illustrating the climatic and other conditions on the streams from which the fish were secured.

Duckmaloi River.

The Duckmaloi River is about 104 miles from Sydney, 10 miles from Hampton, New South Wales. The banks are clothed with tea tree scrub, but this has been partially cleared in many places in which the fish were taken. Weather in December was wet, but fine weather prevailed in January.

Badja River.

The season on the Badja opened with very cold and unsettled weather, but after two or three days it cleared, but remained changeable for some time. From then onwards until about the middle of December there was wonderful fishing. Mr. S. N. Stewart reports that the fishing has not been better for the past fifteen or sixteen years, and there were more big fish caught this season than in any other season that he can remember. This, in his opinion, was due to floods having cleared out all weeds, with the result that the fish had to work for their living, a big proportion of their food supply, which they obtained from the weeds, having gone. During January easterly fogs were experienced which spoilt the fishing, and decent fish were landed only towards the close of the afternoon. During the whole of the season the Badja was never down to normal, owing to wet weather. Near the end of the season, during Easter, more heavy rain was experienced.

Little Manning River.

Note by Mr. G. H. Montgomery.—"To-day I have left a jar of Trout stomachs (all Rainbows), which I collected from the Little Manning River (local name Gummi River), Barrington Tops. All these fish were in excellent condition, there being an abundance of feed about, yet, strange to relate, no fish were taken over 3 lb. in weight. Further, I did not notice so many yabbies (crayfish) in the stomachs. There seemed to be a greater proportion of females taken this year than last year."

Tuross River.

Note by Dr. A. J. Spiller Brandon.—"A second bottle of stomachs, bringing us up to the above date (20th February, 1935), is now filled. It was late in December that the collection started, and for three weeks I had the able assistance of Mr. W. H. Ifould. When we arrived on the Tuross late in December the tea tree was just coming into full bloom, and consequently the tea tree beetle was very much in evidence, but just after Christmas the Christmas beetle, or what I have always known as the Cockchafer, made its appearance in large numbers and was falling

into the water from the overhanging trees in great quantities. The fish seemed to be enjoying themselves on these, and it is marvellous that they took the artificial fly at all. About the end of January the tea tree had all gone to seed, and the beetles became very scarce. Usually at this time of the year the grasshopper becomes evident, but this year they are conspicuous by their absence. About the end of February a small black fly, which I have always known as a 'Smut,' made its appearance in great quantities, and the fish were feeding on them ravenously; this was particularly so on 16th, 17th, and 18th February. There is one stomach that is labelled 'Murphy's'; this was taken from a portion of the pool devoid of overhanging trees or scrub, and it will be interesting to know whether this fish was obtaining beetles that had floated down from the timbered country or was feeding on caddis. During the period there were one or two freshes in the river, but these have been noted on the cards."

Stomach Contents of Rainbow Trout.

(*Salmo irideus* Gibbons.)

Duckmaloi River.

No. 1.— ♂, $\frac{3}{4}$ lb.; 26 January, 1935. Collected by Mr. A. E. Church. Coleoptera: 3 Dryopid larvæ. Miscellaneous: A small quantity of gravel.

Big Badja River.

No. 2.— ♀, 6 lb.; 27 December, 1934. Collected by Rev. W. A. Evans.—Coleoptera: 10 large water beetles (*Homodytes scutellaris*). Trichoptera: 75 caddis-cases (sand), 6 large caddis-cases (stick). Odonata: 2 Zygopterid nymphs. Miscellaneous insects: 6 aquatic larvæ? Mammalia: leg-bones of small mammal (? mouse).

No. 3.— ♀, $1\frac{1}{2}$ lb.; 1 January, 1935. Collected by Rev. W. A. Evans.—Coleoptera: 1 *Lagria grandis*, 1 Longicorn beetle (*Ancita crocogaster*), 2 *Diphucephala* sp., 3 *Heteronyx* sp., and a large quantity of coleopterous remains. Hemiptera: 1 cicada (*Melampsalta encausta*) ♂, 2 *Corixa* sp. Hymenoptera: 5 winged ants (? gen. et. sp.). Diptera: 1 Stratiomyid fly (? gen. et. sp.), and a quantity of triturated dipterous remains. Trichoptera: 312 cadis-cases (sand).

No. 4.— ♂, $1\frac{1}{4}$ lb.; 1 January, 1935. Collected by Rev. W. A. Evans.—Coleoptera: 1 *Phyllotocus navicularis*, and a small quantity of coleopterous remains. Hemiptera: 1 water bug (*Sphærodema* sp.). Hymenoptera: 7 bees (*Hylæus* sp.), 1 bee (? gen. et. sp.). Trichoptera: 6 caddis-cases (sand), 1 large caddis-case (stick). Odonata: 1 Anisopterid nymph. Diptera: a small quantity of remains.

No. 5.— ♀, 3 lb.; 1 January, 1935. Collected by Rev. W. A. Evans.—Coleoptera: 1 *Phyllotocus navicularis*. Hemiptera: 2 *Corixa* sp. Hymenoptera: 1 bee (*Hylæus* sp.), 1 Bulldog ant (*Myrmecia gulosa*). Trichoptera: 537 caddis-cases (sand). Diptera: 1 March fly (*Tabanus* sp.).

No. 6.— ♀, 1½ lb.; 1 January, 1935. Collected by Rev. W. A. Evans. Coleoptera: 3 *Phyllotocus navicularis*, 2 *Heteronyx* sp., 1 *Lagria grandis*, 1 *Cadmus litigiosus*, 1 Tenebrionid beetle (*Adelium* sp.), 1 Longicorn beetle (*Macrones* sp.), and a quantity of coleopterous remains. Hemiptera: 2 Pentatomid bugs (? gen. et. sp.) Hymenoptera: 3 bees (*Hylæus* sp.). 2 Ichneumon wasps (? gen. et sp.), 1 Thynnid wasp ♂ (? gen. et sp.), 1 bee (*Apis mellifica*). Orthoptera: 1 immature Acridiid (? gen. et sp.). Trichoptera: 247 caddis-cases (sand). Odonata: 2 Anisopterid nymphs. Ephemeroptera: 16 mayflies and quantity of remains. Diptera: 5 Stratiomyid flies (*Odontomyia* sp.) 4 ♂, 1 ♀, 1 Leptid fly (? gen. et sp.). Miscellaneous insects: quantity of finely divided insect remains.

No. 7.—? sex, 7 lb.; November, 1934. Collected by Mrs. Drysdale.—Coleoptera: elytra of Tenebrionid beetle (? gen. et sp.). Mollusca: 1 *Bullinus* sp.

No. 8.—? sex, ? weight; December, 1934. Collected by Mr. F. W. Barrett. Coleoptera: 2 *Paropsis* sp., 3 Soldier beetles (*Telephorus pulchellus*), 1 Ladybird beetle (*Leis conformis*), 1 Tenebrionid beetle (? gen. et sp.), 1 *Diphucephala* sp. Trichoptera: 50 caddis-cases (sand). Odonata: 2 Anisopterid nymphs. Perlaria: wings of Stone-flies. Ephemeroptera: 1 mayfly. Miscellaneous insects: small quantity of triturated insect remains.

No. 9.— ♀, ¾ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Trichoptera: 2 caddis-cases (sand), 1 caddis-case (reed). Odonata: 1 large Anisopterid nymph. Araneidæ: 1 spider (*Araneus* sp.).

No. 10.—? sex, 1¼ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Coleoptera: 1 *Lagria grandis*, 1 Click beetle (Elateridæ; ? gen. et sp.), 4 *Cryptocephalus* sp., 1 *Liparetrus* sp. Hemiptera: 1 Jassid (? gen. et sp.). Hymenoptera: 2 Bulldog ants (*Myrmecia gulosa*). Trichoptera: 100 caddis-cases (sand). Ephemeroptera: 28 mayflies and remains of numerous others. Diptera: 3 Bibionid flies, 1 fly (Syrphidæ). Miscellaneous insects: quantity of remains. Araneidæ: 1 spider (*Araneus* sp.).

No. 11.— ♂, 4 lb.; December, 1934. Collected by Mr. F. W. Barrett.—Note.—Completely empty.

No. 12.— ♀, ¾ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Trichoptera: 4 caddis-cases (sand). Odonata: 1 Anisopterid nymph, wings of Zygopterid dragonflies. Ephemeroptera: 3 may-flies. Miscellaneous insects: small quantity of broken insect remains. Miscellaneous: 1 feather.

No. 13.— ♂, 1¼ lb.; December, 1934. Collected by Mr. F. W. Barrett.—105 caddis-cases (sand).

No. 14.— ♀, 1½ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Coleoptera: 1 *Phyllotocus navicularis*, 1 *Berosus* sp. Hemiptera: 1 cicada (*Melampsalta* sp.). Hymenoptera: 1 Bulldog ant (*Myrmecia gulosa*), 2 ants (*Iridomyrmex* sp.). Trichoptera: 1 caddis nymph. Odonata: wings of Anisopterid dragonflies, 1 Anisopterid nymph. Ephemeroptera: 1 mayfly.

No. 15.—? sex, 1¾ lb.; December, 1934.Collected by Mr. F. W. Barrett.—Coleoptera: 1 *Phyllotocus navicularis*. Trichoptera: 83 caddis-cases. Ephemeroptera: 1 mayfly.

No. 16.—? sex, 3 lb.; December, 1934. Collected by Mr. F. W. Barrett.—**Coleoptera**: 1 Gyrinid beetle (*Macrogyrus australis*), 1 Dytiscid beetle (*Hyderodes shuckhardi*). Trichoptera: 19 caddis-cases.

No. 17.— ♀, 2¾ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Trichoptera: 92 caddis-cases. Miscellaneous: piece of wood, ¾ x ¼ inches.

No. 18.—? sex, 1½ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Trichoptera: 12 caddis-cases (sand). Ephemeroptera: 1 mayfly.

No. 19.—? sex, 2½ lb.; 23 December, 1934. Collected by Mr. F. W. Barrett.—Coleoptera: 1 Carab beetle (? gen. et sp.). Hemiptera: 6 *Corixa* sp. Orthoptera: 1 cockroach (*Panesthia granicollis*). Trichoptera: 21 caddis-cases (sand), 4 caddis-cases (stick). Odonata: 2 Zygopterid dragonflies (imagines), head of Anisopterid dragonfly, 1 Anisopterid nymph. Ephemeroptera: 1 mayfly. Vermes: 1 Gordian worm. Amphibia: bones of frog.

Power Creek.

No. 20.— ♀, 1½ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Trichoptera: 2 caddis-cases (sand).

No. 21.— ♂, 1½ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Coleoptera: 1 water beetle (*Berosus* sp.). Hemiptera: 1 Jassid (? gen. et sp.), 1 *Naucoris australasicus*? Trichoptera: 47 caddis-cases (sand), 10 caddis-cases (stick). Odonata: 1 Anisopterid nymph. Diptera: 3 Crane flies (? gen. et sp.) (imagines), 2 Stratiomyid flies (*Odontomyia carinifacies*). Miscellaneous insects: small quantity of broken insect remains.

No. 22.— ♂, 2¼ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Trichoptera: 141 caddis-cases (sand), 2 caddis-cases (stick). Ephemeroptera: 1 very small mayfly nymph.

Counteguany Creek.

No. 23.— ♀, 2 lb.; 20 December, 1934. Collected by Rev. W. A. Evans.—Coleoptera: head of Hydrophylid larva. Trichoptera: 23 large caddis-cases (stick).

No. 24.— ♂, 3½ lb.; 20 December, 1934. Collected by Rev. W. A. Evans.—Coleoptera: 78 *Phyllotocus navicularis* and a large quantity of remains. Hymenoptera: 1 bee (*Hylæus* sp.). Trichoptera: 1 caddis-case (sand).

No. 25.— ♀, 1½ lb.; 20 December, 1934. Collected by Rev. W. A. Evans.—Trichoptera: 7 caddis-cases (stick), 9 caddis-cases (sand). Miscellaneous: 1 feather. Vegetable matter: a quantity of leaves and vegetable debris.

No. 26.— ♀, 1½ lb.; 1 January, 1935. Collected by Rev. W. A. Evans.—Coleoptera: 5 *Phyllotocus navicularis* and broken remains of others. Trichoptera: 6 caddis-cases (sand). Odonata: 1 Zygopterid dragonfly (imago). Ephemeroptera: 9 may-flies and a large quantity of remains. Miscellaneous: 1 feather, 2 large quartz pebbles.

No. 27.—? sex, 3¼ lb.; December, 1934. Collected by Mr. F. W. Barrett.—Coleoptera: 5 *Phyllotocus navicularis*.

Little Manning River.

No. 28.— ♂, 1½ lb.; 2 February, 1935. Collected by Mr. G. H. Montgomery.—Fly: Invicta. Coleoptera: 1 Dryopid larva. Trichoptera: 334 caddis-cases (sand). Ephemeoptera: 1 mayfly nymph.

No. 29.— ♀, 12 oz.; 2 February, 1935. Collected by Mr. G. H. Montgomery.—Fly: Red Tag Governor. Trichoptera: 73 caddis-cases (sand), 1 caddis fly (imago). Odonata: wings of Zygopterid dragonflies. Ephemeroptera: 1 mayfly nymph.

No. 30.— ♂, 12 oz; 2 February, 1935 Collected by Mr G. H. Montgomery.—Fly: Red Tag Governor. Trichoptera: 212 caddis-cases (sand). Ephemeroptera: wing of mayfly.

No. 31.— ♀, 1 lb.; 2 February, 1935. Collected by Mr. G. H. Montgomery.—Fly: Invicta. Coleoptera: 6 Soldier beetles (*Telephorus pulchellus*), 1 Click beetle (*Crepidomenus* sp.), 1 Dytiscid beetle (? gen. et sp.), 1 Dung beetle (*Onthophagus granulatus*), 6 Chrysomelid beetles (? gen. et sp.). Hymenoptera: 1 winged and ♂ (*Myrmecia* sp.). Orthoptera: 1 Acridiid (immature). Lepidoptera: 2 moths (? gen. et sp.). Odonata: mask of Anisopterid nymph. Miscellaneous insects: small quantity of unidentifiable insect remains. Vegetable matter: quantity of vegetable matter.

No. 32.— ♂, 1 lb.; 2 February, 1935. Collected by Mr. G. H. Montgomery.—Fly: Red Tag Governor. Coleoptera: 1 small Dytiscid beetle (? gen. et sp.). Trichoptera: 57 caddis-cases (sand). Odonata: 1 Anisopterid nymph. Crustacea: 10 ? Pontogeneidæ, near *Atyloides*. Vegetable matter: large quantity of Algæ.

No. 33.— ♂, 17 oz.; 3 February, 1935. Collected by Mr. G. H. Montgomery.—Fly: March Brown. Coleoptera: 2 *Diphucephala elegans*, 1 Click beetle (Elateridæ; *Crepidomenus* sp.), 1 weevil (*Balaninus* sp.), 1 *Heteronyx* sp., 1 *Cryptocephala* sp. Hymenoptera: 3 Thynnid wasps (? gen. et sp.) 2 ♂. 1 ♀. Orthoptera: 2 immature Acridiidæ. Trichoptera: 121 caddis-cases (sand), 1 caddis-case (stick). Ephemeroptera: 2 may-flies. Diptera: 3 flies (? gen. et sp.). Miscellaneous insects: quantity of insect remains. Vegetable matter: quantity of vegetable matter.

No. 34.— ? sex, 1 lb.; 3 February, 1935. Collected by Mr. G. H. Montgomery.—Fly: Alexandria Coleoptera: 1 weevil (? *Balaninus* sp.). Hymenoptera: 5 winged ants (? gen. et sp.). Trichoptera: 1 caddis-fly, 7 caddis-cases (sand). Odonata: wings of Zygopterid dragonfly. Ephemeroptera: 4 mayfly, 4 mayfly nymphs. Araneidæ: 1 spider (*Epeira* sp.). Miscellaneous: quantity of sand and gravel.

No. 35.— ♀, 1 lb. 6 oz.; 3 February, 1935. Collected by Mr. G. H Montgomery. Fly: March Brown. Coleoptera: 2 Heteronyx. Trichoptera: 723 caddis-cases (sand). Ephemeroptera: 1 mayfly. Miscellaneous insects: small quantity of finely broken insect remains.

No. 36.— ♂, ¾ lb.; 5 February, 1935. Collected by Mr. G. H. Montgomery.—Trichoptera: 181 caddis-cases (sand). Crustacea: 67 Pontogeneidæ near *Atyloides*.

No. 37.— ♀, 2¾ lb.; 5 February, 1935. Collected by Mr. G. H. Montgomery.—Fly: Hare's Ear. Coleoptera: 2 Fire-fly beetles (Lampyridæ; ? gen. et sp.). Hemiptera: 1 Reduviid bug (? gen. et sp.). Hymenoptera: 3 winged ants (? gen. et sp.), 1 Honey-bee (*Apis mellifica*). Trichoptera: 770 caddis-cases (sand), 3 caddis-cases (stick). Lepidoptera: 2 moths (? gen. et sp.). Odonata: quantity of wings of Anisopterid dragonflies. Ephemeroptera: 2 mayflies, 2 mayfly nymphs. Diptera: 1 large Asilid fly (*Neoaratus* sp.). Araneidæ: 1 spider (*Araneus* sp.).

No. 38.— ♀, 13 oz.; 7 February, 1935. Collected by Mr. G. H. Montgomery.—Coleoptera: 1 *Figulus regularis*, 1 Chrysomelid beetle (? gen. et sp.), 4 *Diphucephala elegans*, and a quantity of coleopterous remains. Trichoptera: 730 caddis-cases (sand). Vegetable matter: quantity of Algæ.

No. 39.— ♀, 1½ lb.; 8 February, 1935. Collected by Mr. G. H. Montgomery.—Fly: Hardy's Favourite. Coleoptera: head of Longicorn beetle (? gen. et sp.). Trichoptera: 7 caddis-cases (stick), 3 caddis-cases (sand). Odonata: 2 Anisopterid dragonflies (imagines). Vermes: 4 Gordian worms.

No. 40.— ♂, 1 lb.; 8 February, 1935. Collected by Mr. G. H. Montgomery.—Fly: Barnwell Glory. Coleoptera: 2 Dryopid larvæ, 2 Fire-fly beetles (Lampyridæ; ? gen. et sp.). Hemiptera: 1 Reduviid bug (? gen. et sp.). Trichoptera: 117 caddis-cases (sand). Ephemeroptera: 1 mayfly nymph.

No. 41.— ♀, 12 oz.; 8 February, 1935. Collected by Mr. G. H. Montgomery.—Hemiptera: 1 Reduviid bug (? gen. et sp.). Trichoptera: 128 caddis-cases (sand), 1 caddis-case (stick). Araneidæ: 1 spider (*Araneus* sp.). Vegetable matter: quantity of Algæ.

No. 42.— ♂, 18 oz.; 9 February, 1935. Collected by Mr. G. H. Montgomery.—Trichoptera: 22 caddis-cases. Odonata: 1 Anisopterid nymph. Ephemeroptera: 17 mayfly nymphs. Vegetable matter: large mass of Algæ.

No. 43.— ♂, 12 oz.; 9 February, 1935. Collected by Mr. G. H. Montgomery.—Trichoptera: 430 caddis-cases (sand).

No. 44.— ♂, 12 oz.; 10 February 1935. Collected by Mr. G. H. Montgomery.—Hemiptera: 1 Pentatomid bug (*Cermatulus nasalis*), 3 *Corixa* sp. Hymenoptera: 1 winged ant (*Iridomyrmex* sp.). Trichoptera: 85 caddis-cases (sand). Diptera: 4 Chironomid midges. Thysanoptera: 1 *Idolothrips spectrum*.

No. 45.— ♀, 14 oz.; 10 February 1935. Collected by Mr. G. H. Montgomery.—Cleoptera: 1 weevil (*Balaninus* sp.). Orthoptera: 1 immature Acridiid. Trichoptera: 160 caddis-cases (sand). Odonata: 1 Anisopterid dragonfly (imago), 1 Anisopterid nymph. Crustacea: 134 Pontogeneidæ near *Atyloides*.

No. 46.— ♀, 9 oz.; 10 February, 1935. Collected by Mr. G. H. Montgomery.—Trichoptera: 55 caddis-cases. Crustacea: 157 Pontogeneidæ near *Atyloides*.

No. 47.— ♀, 1¾ lb.; 10 February, 1935. Collected by Mr. G. H. Montgomery.—Vegetable matter: stomach crammed to capacity with a mass of green Algæ.

No. 48.— ♂, ? weight; 10 February, 1935. Collected by Mr. G. H. Montgomery. Coleoptera: 1 weevil (*Balaninus* sp.). Hemiptera: 1 Jassid (immature). Hymenoptera: 1 Thynnid wasp ♂ (? gen. et sp.). Orthoptera: 1 Acridiid (immature). Trichoptera: 32 caddis-cases (sand). Lepidoptera: 1 moth (? gen. et sp.). Diptera: 1 fly (? gen. et sp.). Arachnida: 1 Pseudoscorpion (? gen. et sp.). Amphibia: bones of a frog. Crustacea: 112 Pontogeneidæ ? near *Atyloides*.

Tuross River.

No. 49.— ♀, 1 lb.; 24 December, 1934, 2 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Red Cocky. Coleoptera: 3 *Phyllotocus navicularis*. Hymenoptera: 2 Saw-flies (*Perga ferruginea*). Trichoptera: 127 caddis-cases (sand), 2 caddis-cases (stick). Odonata: wings of Zygopterid dragonflies. Diptera: 1 Stratiomyid fly (*Odontomyia* sp.).

No. 50.— ♀, 1 lb.; 26 December, 1934, 5·30 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Red Palmer. Coleoptera: 1 *Heteronyx*. Hymenoptera: 1 Eumenid wasp (? gen. et sp.). Trichoptera: 23 caddis-cases (sand), 1 caddis-case (stick).

No. 51.— ♀, 2 lb.; 27 December, 1934, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Black Hackle. Coleoptera: 1 Tenebrionid beetle (*Adelium* sp.). Trichoptera: 24 caddis-cases (sand), 16 caddis-cases (stick). Odonata: 4 Zygopterid dragonflies (imagines). Diptera: 1 Bibionid fly. Crustacea: 1 Yabbie (*Parachæraps bicarinatus*). Miscellaneous: 1 feather.

No. 52.— ♀, 1 lb.; 28 December, 1934, 11·45 a.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Black Hackle. Coleoptera: 1 *Diphucephala* sp., 1 *Cryptocephalus* sp. Hemiptera: 1 *Corixa* sp. Hymenoptera: 4 winged ants (*Iridomyrmex* sp.). Trichoptera: 6 caddis-cases (sand). Ephemeroptera: 8 mayflies, 1 mayfly nymph. Araneidæ: 1 spider (*Araneus* sp.).

No. 53.— ♀, 1½ lb.; 28 December, 1934, 5 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Black Hackle. Coleoptera: 1 Christmas beetle (*Anoplognathus pectoralis*), 1 *Heteronyx* sp., 10 *Phyllotocus navicularis*, 1 Click beetle (Elateridæ; ? gen. et sp.). Hymenoptera: 2 bees (*Hylæus* sp.). Trichoptera: 11 caddis-cases (stick), 4 caddis-cases (sand). Odonata: 1 Agrionid dragonfly (imago). Ephemeroptera: 2 mayflies and remains of many others. Miscellaneous insects: quantity of finely triturated insect remains.

No. 54.— ♀, 1 lb.; 29 December, 1934, 5·30 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Red Cocky. Coleoptera 16 *Heteronyx* sp., 15 *Phyllotocus navicularis*, 18 *Liparetrus* sp., 1 *Paropsis* sp., 3 Click beetles (Elateridæ; ? gen. et sp.), 27 Chrysomelid beetles (? gen. et sp.), 1 Longicorn beetle (*Phoracantha* sp.), Tenebrionid beetle (? gen. et sp.). Hemiptera: 1 Tree-hopper (*Eurymela* sp.), 2 Pentatomid bugs (? gen. et sp.), 1 Jassid (? gen. et sp.). Hymenoptera: 13 bees (*Halictus* sp.), 1 Thynnid wasp ♀ (? gen. et sp.), 2 Saw-flies (*Perga* sp.). Trichoptera: 1 caddis-case (stick). Odonata: 1 Zygopterid dragonfly (imago). Ephemeroptera: remains of mayflies. Isoptera: 1 winged termite (? gen. et sp.). Miscellaneous insects: large quantity of finely triturated insect remains. Araneidæ: 1 spider (*Araneus* sp.). Vermes: 1 Gordian worm.

No. 55.— ♀, 1 lb.; 29 December, 1934, 5 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Red Cocky. Coleoptera: 1 *Phyllotocus navicularis*. Trichoptera: 566 caddis-cases (sand). Ephemeroptera: 2 mayflies. Araneidæ: 1 spider (*Araneus* sp.).

No. 56.— ♀, 1¼ lb.; 29 December, 1934, 6·30 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Red Cocky. Coleoptera: 1 Christmas beetle (*Anoplognathus pectoralis*), 18 *Phyllotocus navicularis*, 26 *Litochrus* sp., 10 Click beetles (Elateridæ; (? gen. et spp.), 2 *Cryptocephalus* sp., 1 Ladybird beetle (*Leis conformis*), 9 Chrysomelid beetles (? gen. et sp.), and a quantity of coleopterous remains. Hymenoptera: 8 bees (? *Hylæus* sp.). Trichoptera: 4 caddis-cases (sand). Odonata: 1 Zygopterid dragonfly (imago). Diptera: 1 large Asilid fly (? gen. et sp.). Miscellaneous insects: large quantity of finely divided and unidentifiable insect remains.

No. 57.— ♀, 2 lb.; 31 December, 1934, 7 p.m. Collected by Dr. A. J. Spiller Grandon.—Fly: Black Hackle. Coleoptera: 1 Christmas beetle (*Anoplognathus pectoralis*), 9 *Phyllotocus navicularis*, 2 Dung beetles (*Onthophagus granulatus*), 1 Click beetle (Elateridæ; ? gen. et sp.), 5 Chrysomelid beetles (? gen. et sp.), 1 Soldier beetle (*Telephorus pulchellus*), 1 Paropsis larva. Hymenoptera: a wasp (*Sphex* sp.), 2 Thynnid wasps ♂ and ♀ (gen. et sp.). Lepidoptera: 1 moth (? gen. et sp.). Ephemeroptera: 1 mayfly. Miscellaneous insects: small quantity of insect remains.

No. 58.— ♀, 1 lb.; 31 December, 1934, 7·30 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Red Cocky. Coleoptera: 1 *Phyllotocus navicularis*. Hymenoptera: 1 winged ant (? gen. et sp.). Trichoptera: 5 caddis-cases (sand). Vegetable matter: Several fragments of green weed.

No. 59.— ♀, ? weight; 3 January, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 14 Christmas beetles (*Anoplognathus pectoralis*), 6 *Heteronychus* spp., 1 *Phyllotocus navicularis*. Trichoptera: 2 caddis-cases (stick).

No. 60.— ♀, 1¼ lb.; 7 January, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Black Hackle. Coleoptera: 3 Christmas beetles (*Anoplognathus pectoralis*), 1 Dytiscid beetle (*Rhantus pulverosus*), 2 Click beetles (Elateridæ; ? gen. et sp.), 1 Longicorn beetle (*Pempsamacra* sp.), 1 *Phyllotocus* sp., 3 Chrysomelid beetles (? gen. et sp.). Hemiptera: 2 *Corixa* sp. Hymenoptera: 1 Ichneumon wasp ♀ (*Lissopimpla semipunctata*), Head of Bulldog ant (Myrmecia sp.). Trichoptera: 7 caddis-cases (sand), 2 caddis-cases (stick). Lepidoptera: 1 moth (? gen. et sp.). Ephemeroptera: 1 mayfly. Miscellaneous insects: large quantity of finely broken and unidentifiable insect remains.

No. 61.— ♀, 2½ lb.; 15 January, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Black Hackle. Note: River falling after rise of 2 feet. Coleoptera: 4 *Phyllotocus navicularis*. Trichoptera: 25 caddis-cases (stick), 7 caddis-cases (sand).

No. 62.— ♀, 1 lb.; 25 January, 1935, 2 p.m. Collected by Dr. A. J. Spiller Brandon. —Fly: Black Hackle. Coleoptera: 6 *Phyllotocus navicularis*, 1 Click beetle (Elateridæ; ? gen. et sp.). Hymenoptera: 1 Braconid wasp (? gen. et sp.). Trichoptera: 11 caddis-cases (sand). Odonata: 16 Zygopterid dragonflies (imagines). Diptera: 1 Robber fly (*Neoaratus* sp.), 1 Bibionid fly (*Bibio* sp.).

No. 63.— ♀, 1¼ lb.; 25 January, 1935, 8 p.m. Collected by Dr. A. J. Spiller Brandon. —Fly: Pennell Hackle. Coleoptera: 1 Christmas beetle (*Anoplognathus pectoralis*). Trichoptera: 3 caddis-cases (stick).

No. 64.— ♀, ¾ lb.; 26 January, 1935, 12·30 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Black Hackle. Empty.

No. 65.— ♀, 2 lb.; 1 February, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon. —Trichoptera: 7 caddis-cases (sand), 2 caddis-cases (stick). Ephemeroptera: 1 mayfly nymph. Miscellaneous: 1 quartz pebble.

No. 66.— ♂, 1 lb.; 3 February, 1935, 2·30 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Pennell Hackle. Trichoptera: 4 caddis-cases (sand). Ephemeroptera: 1 mayfly. Vegetable matter: a quantity of leaves and partly digested vegetable matter.

No. 67.— ♂, 1½ lb.; 9 February, 1935, 12·30 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Pennell Hackle. Coleoptera: 1 Longicorn beetle (*Disterna* sp.), 1 *Paropsis* larva. Hemiptera: 2 Jassids (? gen. et sp.). Trichoptera: 8 caddis-cases (sand). 3 caddis-cases (stick). Miscellaneous: 1 feather. Vegetable matter: quantity of leaves.

No. 68.— ♀, ? weight; 9 February, 1935, 5 p.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Pennell Hackle. Trichoptera: 6 caddis-cases (sand), 1 caddis-case (stick). Odonata: 1 large Agrionid dragonfly (imago), 1 Agrionid nymph, 1 Zygopterid nymph. Araneidæ: 1 spider (*Araneus* sp.). Vegetable matter: a quantity of Algæ.

No. 69.— ♀, 1 lb.; 11 February, 1935, 5 p.m. Collected by Dr. A. J. Spiller Brandon.—Note.—Fresh subsiding. Coleoptera: 1 weevil (*Belus* sp.), 1 *Heteronyx* sp. Trichoptera: 1 caddis-case (stick). Miscellaneous: small quantity of gravel. Vegetable matter: partly digested vegetable matter.

No. 70.— ♀, 1 lb.; 12 February, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon.—Note.—River falling. Coleoptera: 53 *Heteronyx* sp., 1 *Figulus liliputana*, 1 *Paropsis* sp., 1 Carab beetle (*Xanthophea* sp., 1 Christmas beetle (*Anoplognathus pectoralis*), 6 Chrysomelid beetles (? gen. et sp.), and quantity of unidentifiable remains. Hemiptera: 1 Tree-hopper (*Tartessus io*), 1 Tree-hopper (*Stenocotis caudata*). Hymenoptera: 1 winged Bulldog ant (*Myrmecia* sp.). Lepidoptera: 1 small moth (? gen. et sp.). Odonata: 3 Zygopterid dragonflies (imagines). Diptera: 1 Bibionid fly (? gen. et sp.), and quantity of dipterous remains. Amphibia: 1 small frog.

No. 71.— ♀, 1 lb.; 16 February, 1935, 11·5 a.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Pennell Hackle. Coleoptera: 8 *Heteronyx* sp. Hemiptera: 1 Tree-hopper (*Eurymela distincta*). Odonata: 1 Zygopterid dragonfly (imago). Diptera: head of fly. Miscellaneous insects: small quantity of finely divided insect remains.

No. 72.— ♀, 1 lb.; 16 February, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon.—Fly: Pennell Hackle. Amphibia: 5 frogs (1 large ♀).

No. 73.— ♀, 1 lb.; 17 February, 1935, 12·15 p.m. Collected by Dr. A. J. Spiller Brandon. Coleoptera: 7 *Heteronyx* sp. Hymenoptera: 8 winged ants (*Iridomyrmex* sp.). Trichoptera: 7 caddis-cases (sand), 2 caddis-cases (stick). Isoptera: 7 winged termites and quantity of remains.

No. 74.— ♀, 1¼ lb.; 17 February, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon.—Coleoptera: 1 *Aphodius* sp., 2 *Heteronyx* sp., 2 *Paropsis* spp., 1 Longicorn beetle (*Hesthesis* sp.), 1 Longicorn beetle (near *Tessaromma*), 1 Clerid beetle (? gen. et sp.), 4 Chrysomelidæ (? gen. et sp.). Hemiptera: 3 Tree-hoppers (? gen. et sp.). Hymenoptera: 44 winged ants (*Iridomyrmex* sp.), 1 bee (*Halictus* sp.). Trichoptera: 4 caddis-cases (sand), 1 caddis-case (stick). Odonata: 2 Zygopterid dragonflies (imagines). Isoptera: 55 winged termites (*Coptotermes* sp.). Amphibia: 2 large frogs.

No 75.— ♀, 1 lb.; 17 February, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon.—Coleoptera : 1 Christmas beetle (*Anoplognathus pectoralis*), 2 *Aphodius* sp., 2 *Heteronyx* sp. Hymenoptera: 53 winged ants (*Iridomyrmex* sp.). Trichoptera: 6 caddis-cases (sand), 2 caddis-cases (stick). Miscellaneous insects : small quantity of insect fragments.

No. 76.— ♀, 1 lb.; 17 February, 1935, 1·30 p.m. Collected by Dr. A. J. Spiller Brandon.—Coleoptera : 1 Longicorn beetle (near *Tessaromma*), 1 Longicorn beetle (? gen. et sp.), 2 *Heteronyx* sp., and remains of others. Hymenoptera : 5 winged ants (*Iridomyrmex* sp.). Trichoptera: 2 caddis-cases (stick). Diptera: 8 Mycetophyllid midges. Araneidæ: 1 Spider (*Epeira* sp.). Amphibia : 1 small frog.

No. 77.— ♀, 1 lb ; 17 February, 1935, 1 p.m. Collected by Dr. A. J. Spiller Brandon.—Coleoptera : 11 *Aphodius* sp., 17 *Heteronyx* sp., 1 Click beetle (Elateridæ; ? gen. et sp.), 1 Soldier beetle (*Telephorus pulchellus*). Hemiptera : 4 Tree-hoppers (? gen. et sp.). Hymenoptera : 2,000 winged ants (*Iridomyrmex* sp.) Trichoptera: 4 caddis-cases (sand). Ephemeroptera: 1 mayfly nymph. Isoptera : 47 winged termites (*Coptotermes* sp.).

No. 78.— ♀, 1 lb.; 17 February, 1935, 2 p.m. Collected by Dr. A. J. Spiller Brandon.—Coleoptera : 29 *Heteronyx* sp., 1 Tenebrionid beetle (? gen. et sp.), 9 Chrysomelid beetles (? gen. et sp.). Hymenoptera : 1,297 winged ants (? *Iridomyrmex* sp.), 1 bee (*Halictus* sp.). Trichoptera : 23 caddis-cases (sand), 2 caddis-cases (stick). Diptera : 15 Mycetophyllid midges. Isoptera : 27 winges termites (*Coptotermes* sp.). Miscellaneous insects: very large quantity of finely broken and unidentifiable insect remains. Amphibia : bones of frog.

No. 79.— ♀, 1 lb.; 18 February, 1935, 11·15 a.m. Collected by Dr. A. J. Spiller Brandon.—Coleoptera : 1 *Paropsis* sp., 2 *Liparetrus* s.p., 1 *Cryptocephalus* sp. Hymenoptera : 76 winged ants ♂♂ and ♀♀ (? gen. et. sp.), 1 bee (*Halictus* sp.), 1 Ichneumon wasp (? gen. et sp.). Trichoptera : 34 caddis-cases (sand), 4 caddis-cases (stick). Odonata: 8 Zygopterid dragonflies (imagines). Thysanoptera: 1 *Idolothrips spectrum*. Miscellaneous insects: quantity of broken insect remains.

Lithgow District.

No. 80.— ♀, ½ lb.; 26 December, 1934. Tarana Quarries. Collected by Lithgow Trout Fishermen's Association.—Vegetable matter: several short pieces of stick.

No. 81.— ♂, ¾ lb.; 22 December, 1934. Sodwalls Creek. Collected by Lithgow Trout Fishermen's Association.—Trichoptera: 1 caddis-case (sand). Lepidoptera : 1 small lepidopterous larva. Odonata : 1 Zygopterid dragonfly (imago). Araneidæ : 1 small spider (*Araneus* sp.). Vegetable matter : quantity of Algæ.

Cotter River.

No. 82.—? sex, 1 lb.; 11 April, 1935. Collected by Dr. Purchas and Mr. E. A. Clayton (per Mr. W. P. Bluett).—Orthoptera: 100 immature Acridiidæ. Reptilia : 1 young lizard (*Amphibolurus* sp.). Vegetable matter : quantity of Algæ.

Mount Kosciusko.

No. 83.— ♀, 6¾ lb.; February, 1935. Collected by Professor W. J. Dakin.—Orthoptera : 394 immature grasshoppers (Acridiidæ; ? *Monistria* sp.).

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons).

Stomach No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Coleoptera—														
Scarabæidæ	...	...	5	1	1	5	...	...	...	1	...	...	...	1
Elateridæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Chrysomelidæ	...	...	...	...	...	1	...	4	...	4	...	...	...	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dryopidæ	3	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	..	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	..	...	...	...	...	...
Lampyridæ	...	...	...	...	...	...	...	3	..	...	...	...	...	...
Tenebrionidæ	...	...	...	...	...	1	1	1	...	...	...	...	...	...
Dytiscidæ	...	10	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	..	...	...	...	...	...	...
Cerambycidæ	...	...	1	...	...	1	...	...	...	...	...	...	...	...
Coccinellidæ	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Hydrophylidæ	...	...	...	...	...	...	...	...	...	...	..	...	...	1
Lagriidæ	...	...	1	...	...	1	...	...	...	1	...	...	...	...
Hemiptera—														
Pentatomidæ	...	...	...	...	...	2	...	...	...	...	...	...	...	...
Jassidæ, etc.	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Naucoridæ	...	...	...	...	...	...	...	...	..	...	...	..	...	...
Corixiidæ	...	...	2	...	2	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	..	...	...	...
Cicadidæ	...	...	1	...	...	...	...	...	...	...	...	...	...	1
Belostomidæ	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Hymenoptera—														
Formicidæ	...	...	5	...	1	...	...	...	...	2	...	...	...	3
Apidæ	...	...	...	8	1	4	...	...	...	..	...	...	...	...
Ichneumonidæ	...	...	...	...	...	2	...	...	...	...	...	...	...	...
Tenthredinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Vespidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—														
Acridiidæ	...	...	...	...	...	1	..	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	...	81	312	7	537	247	...	50	3	100	...	4	105	1
Lepidoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Odonata—														
Anisoptera	...	...	...	1	...	2	...	2	1	...	..	1	...	1
Zygoptera	...	2	...	...	...	...	...	...	...	...	...	*	...	...
Ephemeroptera	...	...	...	...	...	16	...	1	...	28	...	3	...	1
Diptera—														
Syrphidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	..	...	...	...
Stratiomyidæ	...	...	1	...	...	5	...	...	...	..	..	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Leptidæ	...	...	...	...	..	1	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	3	...	...	...	...
Tabanidæ	...	...	...	...	1	...	...	...	...	...	...	..	...	...
Unidentifiable	...	...	*	*	...	...	...	...	...	...	...	...	...	...
Thysanoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	...	...	*	...	...	...	...	...	...
Isoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	*	...	...	...	*	...	*	...	*	...	...	*	...
Arachnida—														
Araneidæ	...	...	...	...	...	...	...	...	1	1	...	...	...	...
Pseudoscorpionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermes	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mollusca	...	...	...	...	...	...	1	...	..	...	...	...	...	...
Amphibia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reptilia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mammalia	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	...	...	...	...	...	...	...	...	...	...	...	...	*	...

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

Stomach No.	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Coleoptera—														
Scarabæidæ	1	...	...	...	...	...	...	...	...	78	...	5	5	...
Elateridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chrysomelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	..	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Carabidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	1	...	...	...	...	...	1	...	...	...	...	...	...	...
Gyrinidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coccinellidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hydrophylidæ	...	...	...	...	...	...	...	...	1	...	...	...	..	...
Lagriidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hemiptera—														
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jassidæ, etc.	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Naucoridæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Corixiidæ	...	...	...	...	6	...	...	...	..	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cicadidæ	...	..	...	...	...	...	...	...	...	...	...	...	...	...
Belostomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—														
Formicidæ	...	...	...	...	...	...	..	...	...	...	...	...	...	...
Apidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenthredinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vespidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—														
Acridiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Trichoptera	83	19	92	12	25	2	57	143	23	1	16	6	...	334
Lepidoptera	...	...	..	...	...	...	...	...	...	...	...	...	...	...
Odonata—														
Anisoptera	...	...	...	...	2	...	1	...	...	...	...	...	...	...
Zygoptera	...	...	...	..	2	...	...	...	...	...	...	1	...	...
Ephemeroptera	1	...	...	1	1	...	...	1	...	...	...	9	...	1
Diptera—														
Syrphidæ	...	...	...	..	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	3	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	2	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Leptidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tabanidæ	...	...	...	...	...	...	...	...	...	..	...	...	...	...
Unidentifiable	...	...	...	...	..	...	...	...	...	...	...	...	...	...
Thysanoptera	...	..	..	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	...	..	...	...	...	...	...	...	...	...	...	...	...
Isoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	...	...	...	...	...	*	...	...	...	...	...	...	...
Arachnida—														
Araneidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pseudoscorpionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermes	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Reptilia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mammalia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	...	...	*	...	...	...	...	...	...	...	*	*	...	...

*Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

Stomach No.	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Coleoptera—														
Scarabæidæ	...	...	1	...	3	...	2	...	...	5	...	...	...	...
Elateridæ	...	...	1	...	1	...	...	...	...	...	...	...	...	...
Chrysomelidæ	...	...	6	...	1	...	...	...	...	1	...	...	...	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	2	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	...	6	...	...	...	...	...	2	...	...	2	...	...
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	1	1	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Coccinellidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hydrophylidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lagriidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hemiptera—														
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jassidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Naucoridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Corixiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	1	...	...	1	1	...
Cicadidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Belostomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—														
Formicidæ	...	...	1	...	...	5	...	...	3	...	...	...	...	...
Apidæ	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenthredinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	...	3	...	...	...	...	...	...	...	...	...
Vespidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—														
Acridiidæ	...	...	1	...	2	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	73	212	...	57	122	8	723	181	773	730	10	117	129	22
Lepidoptera	...	...	2	...	...	...	...	...	2	...	...	...	...	...
Odonata—														
Anisoptera	...	...	1	1	...	...	...	...	*	...	2	...	...	1
Zygoptera	*	...	...	...	...	*	...	...	...	...	...	...	...	...
Ephemeroptera	1	1	...	...	2	8	1	...	4	...	...	1	...	17
Diptera—														
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Leptidæ	...	...	..	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tabanidæ	...	...	...	...	...	...	...	...	...	...	..	...	...	...
Unidentifiable	...	...	...	...	3	...	...	...	...	...	...	...	...	...
Thysanoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Isoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	...	*	...	*	...	*	...	...	...	...	.	...	...
Arachnida—														
Araneidæ	...	...	...	...	...	1	...	...	1	...	...	...	1	...
Pseudoscorpionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermes	...	...	...	...	...	...	...	...	...	...	4	...	...	...
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reptilia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mammalia	...	...	...	...	...	...	...	...	...	...	...	..	...	...
Crustacea	...	...	...	10	...	...	...	67	...	...	...	..	...	...
Miscellaneous	...	...	*	*	*	*	...	...	...	*	...	...	*	*

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

Stomach No.	43	44	45	46	47	48	49	50	51	52	53	54	55	56
Coleoptera—														
Scarabæidæ	...	...	...	...	...	...	3	1	...	1	12	49	1	45
Elateridæ	...	...	...	...	...	...	...	...	...	...	1	3	...	10
Chrysomelidæ	...	...	...	...	...	...	...	...	...	1	...	28	...	11
Curculionidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenebrionidæ	...	...	...	...	...	...	...	...	1	...	...	1	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Coccinellidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Hydrophylidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lagriidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hemiptera—														
Pentatomidæ	...	1	...	...	...	...	...	...	...	...	...	2	...	...
Jassidæ, etc.	...	...	...	...	...	1	...	...	...	...	...	2	...	...
Naucoridæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Corixidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cicadidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Belostomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—														
Formicidæ	...	1	...	...	...	...	...	...	...	4	...	...	...	...
Apidæ	...	...	...	...	...	...	...	...	...	...	2	13	...	8
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenthredinidæ	...	...	...	...	...	...	2	...	...	...	...	2	...	...
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	...	...	1	...	...	...	...	...	1	...	...
Vespidæ, etc	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Orthoptera—														
Acridiidæ	...	...	1	...	...	1	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	430	85	160	55	...	32	129	24	40	6	15	1	566	4
Lepidoptera	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Odonata—														
Anisoptera	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Zygoptera	...	...	...	...	...	...	*	...	4	...	1	1	...	1
Ephemeroptera	...	...	...	...	...	...	...	...	...	9	2	*	2	...
Diptera—														
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	4	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Leptidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Tabanidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Thysanoptera	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Isoptera	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Miscellaneous Insects	...	...	...	...	...	...	...	...	...	...	*	*	...	*
Arachnida—														
Araneidæ	...	...	...	...	...	...	...	...	...	1	...	1	1	...
Pseudoscorpionidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Vermes	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Reptilia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mammalia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	134	157	...	112	...	...	1	...	...	...	...	...
Miscellaneous	...	...	...	...	*	...	...	...	*	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

Stomach No.	57	58	59	60	61	62	63	64	65	66	67	68	69	70
Coleoptera—														
Scarabæidæ	12	1	21	4	4	6	...	...	...	...	...	...	1	55
Elateridæ	1	...	...	2	...	1	...	...	...	...	...	...	...	...
Chrysomelidæ	5	...	...	3	...	...	...	...	...	...	1	...	...	7
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerambycidæ	...	...	...	1	...	...	...	...	...	...	1	...	...	...
Coccinellidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hydrophylidæ	...	...	...	...	...	...	...	...		...	...	...	...	...
Lagriidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hemiptera—														
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jassidæ, etc.	...	...	...	...	...	...	...	...	...	...	2	...	...	2
Naucoridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Corixidæ	...	...	...	2	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cicadidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Belostomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—														
Formicidæ	...	1	...	1	...	...	...	...	...	...	...	...	...	1
Apidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ichneumonidæ	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Tenthredinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Braconidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Thynnidæ	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Vespidæ, etc.	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—														
Acridiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	...	5	2	9	32	11	...	9	4	...	11	7	1	...
Lepidoptera	1	...	...	1	...	...	...	...	...	...	...	...	...	1
Odonata—														
Anisoptera	...	...	...	...	...	...	...	...	...	...	...	2	...	...
Zygoptera	...	...	...	...	...	16	...	...	...	...	...	1	...	3
Ephemeroptera	1	...	...	1	...	...	...	1	1	...	...	...	...	...
Diptera—														
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Leptidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	1
Tabanidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	*
Thysanoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Isoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	*	...	...	*	...	...	...	...	...	...	...	...	...	...
Arachnida—														
Araneidæ	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Pseudoscorpionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermes	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Reptilia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mammalia	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	...	*	...	...	...	...	...	*	*	...	*	*	*	...

* Indicates presence.

Summary of Stomach Contents of Rainbow Trout (*Salmo irideus* Gibbons)—*continued.*

Stomach No.	71	72	73	74	75	76	77	78	79	80	81	82	83	Total.
Coleoptera—														
Scarabæidæ	8	...	7	3	5	2	28	29	2	...	...	...	...	404
Elateridæ	...	...	...	...	...	...	1	...	...	...	...	...	...	22
Chrysomelidæ	...	...	...	6	...	...	...	9	3	...	...	...	...	91
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Cleridæ	...	...	...	1	...	...	...	...	...	...	...	...	...	1
Lampyridæ	...	...	...	...	...	...	1	...	...	...	...	...	...	15
Tenebrionidæ	...	...	...	...	...	...	...	1	...	...	...	...	...	6
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	15
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cerambycidæ	...	...	...	1	...	2	...	...	...	...	...	...	...	9
Coccinellidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Hydrophylidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Lagriidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Hemiptera—														
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Jassidæ etc.	1	...	...	3	...	4	...	...	...	...	...	...	...	17
Naucoridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Corixiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	16
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Cicadidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Belostomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Hymenoptera—														
Formicidæ	...	...	8	44	53	5	2,000	1,297	76	...	...	...	...	3,491
Apidæ	...	...	...	1	...	...	...	1	1	...	...	...	...	41
Ichneumonidæ	...	...	...	...	...	...	...	...	1	...	...	...	...	4
Tenthredinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Braconidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	8
Vespidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Orthoptera—														
Acridiidæ	...	...	...	...	...	...	...	...	...	...	...	100	394	500
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Trichoptera	...	9	...	5	8	2	4	25	38	...	1	...	...	7,270
Lepidoptera	...	...	...	...	...	...	...	...	...	...	1	...	...	9
Odonata—														
Anisoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	19
Zygoptera	1	...	...	2	...	...	...	...	8	...	1	...	...	44
Ephemeroptera	...	...	...	...	...	...	1	...	...	...	...	...	...	116
Diptera—														
Syrphidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Mycetophyllidæ	...	...	...	...	...	8	...	15	...	...	...	...	...	27
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	9
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Leptidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Tabanidæ	...	..	...	...	...	...	...	...	...	...	...	...	...	1
Unidentifiable	*	...	...	...	...	...	...	...	...	...	...	...	...	4
Thysanoptera	...	...	...	...	...	...	...	...	1	...	...	...	...	2
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	*
Isoptera	...	7	...	55	...	...	47	27	...	...	...	...	...	137
Miscellaneous Insects	*	...	...	...	*	...	...	*	*	...	...	...	...	*
Arachnida—														
Araneidæ	...	...	...	...	...	1	...	...	...	...	1	...	...	11
Pseudoscorpionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Vermes	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Mollusca	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Amphibia	...	5	...	2	...	1	...	1	...	...	...	...	...	12
Reptilia	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Mammalia	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Crustacea	...	...	...	...	...	...	...	...	...	...	...	...	...	481
Miscellaneous	...	...	...	...	...	...	...	...	*	*	*	...	...	*

* Indicates presence.

Stomach Contents of Brown Trout.

(*Salmo fario* Linnæus.)

Duckmaloi River.

No. 1.— ♀, 1lb.; 26 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 1 *Paropsis* larva, 1 Click beetle (? gen. et sp.). Hemiptera: 2 immature Pentatomid bugs. Odonata: 1 Anisopterid nymph. Ephemeroptera: 3 mayfly nymphs together with aquantity of mayfly wings and fragmentary remains. Diptera: 1 Mycetophyllid midge. Araneidæ: 1 small spider (*Araneus* sp.).

No. 2.— ♂, 1 lb. 3 oz.; 26 January, 1935. Collected by Mr. A. E. Church.—Trichoptera: 6 caddis-cases (sand). Odonata: 2 Agrionid nymphs.

No. 3.— ♀, ¾ lb.; 26 January, 1935.—Collected by Mr. A. E. Church. NOTE: Very thin fish in poor condition.—Coleoptera: 1 *Paropsis* larva.

No. 4.— ♀, 1 lb.; 26 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 22 *Paropsis* larvæ, 5 *Heteronyx* sp. Hymenoptera: 3 ants (*Iridomyrmex* sp.), 1 ant (*Camponotus* sp.), 1 Bulldog ant (*Myrmecia gulosa*). Orthoptera: 1 grasshopper (immature). Odonata: 2 large anisopterid nymphs. Ephemeroptera: 5 mayflies. Miscellaneous insects: small quantity of broken insect remains. Vermes: 1 Gordian worm.

No. 5.— ♀, 1 lb.; 27 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 2 *Paropsis* larvæ, 1 *Paropsis* (? gen. et sp.). 1 beetle (*Heteronychus* sp.). Hymenoptera: 1 ant (*Iridomyrex* sp.), 1 small wasp (? gen. et sp.). Odonata: 1 large Zygopterid nymph. Ephemeroptera: 3 mayflies and a quantity of wings. Araneidæ: 1 spider (*Tetragnatha* sp.).

No. 6.— ♀, 1½ lb.; 27 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 10 *Paropsis* larvæ, and a quantity of unidentifiable coleopterous remains, 1 Hydrophyllid larva. Trichoptera: 8 caddis-cases (sand). Odonata: 5 large Anisopterid nymphs. Ephemeroptera: 2 mayfly nymphs.

No. 7.— ♂, 1¾ lb.; 27 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 1 small Hydrophylid beetle (? gen. et sp.). Trichoptera: 1 caddis-case (sand).

No. 8.— ♂, 1 lb.; 27 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 1 Dryopid beetle (? sp. nov.). Hymenoptera: 4 ants (various spp.). Trichoptera: 1 caddis-case (sand). Ephemeroptera: 1 mayfly. Miscellaneous insects: very small quantity of unidentifiable insect fragments. Arachnida: 1 *Trombidium* mite.

No. 9.— ♂, 2 lb.; 27 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 1 Gyrinid beetle (? gen et sp.), 1 large Hydrophyllid larva. Hymenoptera: head of Bulldog ant (*Myrmecia* sp.). Trichoptera: 2 caddis-cases (sand). Odonata: wings of Zygopterid dragonflies. Reptilia: 1 lizard (*Lygosoma* sp.) 3 inches long.

No. 10.—? sex, 1 lb.; 28 January, 1935. Collected by Mr. A. E. Church.—Hymenoptera: 1 Bulldog ant (*Myrmecia gulosa*). Odonata: 2 Zygopterid dragonflies (imagines).

No. 11.— ♂, 1 lb. 10 oz.; 28 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 1 Gyrinid beetle (? gen. et sp.). 1 *Paropsis* sp., 3 *Heteronyx* sp. Hymenoptera: 3 ants (various spp.). Orthoptera: 1 Cockroach (*Panesthia* sp.). Lepidoptera: 1 lepidopterous larva. Odonata: 1 large Anisopterid dragonfly (imago) (? gen. et sp.). Ephemeroptera: 2 mayflies. Miscellaneous insects: quantity of finely divided and unidentifiable insect fragments.

No. 12.— ♀, ¾ lb.; 28 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 1 coleopterous larva. Orthoptera: 1 immature locust (Acridiidæ). Trichoptera: 1 caddis-case (sand). Odonata: wings of Zygopterid dragonfly (imago).

No. 13.— ♂, 1 lb. 14 oz.; 28 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 5 *Paropsis* larvæ, and quantity of unidentifiable coleopterous remains. Hemiptera: 1 Reduviid bug (? gen. et sp.). Hymenoptera: 1 bee (*Apis mellifica*), 1 Bulldog ant (*Myrmecia gulosa*), 1 Ichneumon wasp (? gen. et sp.). Orthoptera: 2 Crickets ♂ and ♀ (*Gryllus servillei*). Trichoptera: 1 caddis-fly. Odonata: 1 large Anisopterid nymph. Ephemeroptera: 1 mayfly. Diptera: quantity of unidentifiable remains.

No. 14.— ♀, 1 lb. 2 oz.; 28 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: small quanity of unidentifiable remains. Hemiptera: 1 Pentatomid bug (*Diemenia* sp.), 1 Capsid bug (? gen. et sp.). Hymenoptera: 1 wasp (Psammocharidæ), 2 Bulldog ants (*Myrmecia gulosa*). Odonata: 2 large Anisopterid nymphs.

No. 15.— ♀, 1¾ lb.; 28 January, 1935. Collected by Mr. A. E. Church.—Coleoptera: 1 Histerid beetle (? gen. et sp.), 1 Rhipidocerid beetle. Hymenoptera: 3 Bulldog ants (*Myrmecia ? nigra*). Orthoptera: 1 Cricket (*Gryllus* sp.). Trichoptera: 4 caddis-cases (sand). Lepidoptera: 2 Lepidopterous larvæ. Odonata: 3 small Anisopterid nymphs. Miscellaneous insects: small quantity of unidentifiable remains. Araneida: 1 Huntsman Spider (*Isopeda* sp.).

Tuross River.

No. 16.— ♀, 1¾ lb.; 22 December, 1934, 12·30 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 11 *Phyllotocus navicularis*, 6 *Liparetrus* sp., 1 *Heteronyx* sp., 1 Click beetle (*Crepidomenus* sp.), 1 *Cryptocephalus* sp. Hymenoptera: 1 Sawfly (*Perga dorsalis*) (imago). Trichoptera: 14 caddis-cases (sand). Odonata: 1 Anisopterid nymph, 3 Zygopterid dragonflies (imagines). Ephemeroptera: 3 mayflies. Miscellaneous insects: small quantity of triturated insect remains.

No. 17.— ♂, 2 lb.; 23 December, 1934, 1 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 1 Tenebrionid beetle (? gen. et sp.). Hemiptera: 1 cicada (*Melampsalta encausta*). Trichoptera: 22 caddis-cases (sand), 5 caddis-cases (stick). Odonata: 14 Zygopterid dragonflies (imagines). Miscellaneous insects: small quantity of unidentifiable insect remains. Vermes: 2 Gordian worms.

No. 18.— ♂, 1½ lb.; 24 December, 1934, 12·30 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 3 Christmas beetles (*Anoplognathus pectoralis*), 1 *Phyllotocus navicularis*. Trichoptera: 17 caddis-cases (sand).

No. 19.— ♂, 1½ lb.; 24 December, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Red Cocky. Coleoptera: 1 *Anoplognathus pectoralis*, 1 *Phyllotocus navicularis*, 1 Lampyrid (? gen. et sp.), 2 Click beetles (Elateridæ; ? gen. et sp.), 1 Chrysomelid beetle (? gen. et sp.). Hymenoptera: 1 bee (? *Halictus* sp.). Trichoptera: 6 caddis-cases (sand), 1 caddis-case (stick). Miscellaneous insects: small quantity of unidentifiable insect fragments.

No. 20.— ♀, 1 lb.; 24 December, 1935, 12·45 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 1 Tenebrionid beetle (? gen. et sp.), 2 *Phyllotocus navicularis*, 1 Click beetle (Elateridæ; ? gen. et sp.). Trichoptera: 123 caddis-cases (sand), 1 caddis-case (stick).

No. 21.— ♂, 1¾ lb.; 24 December, 1935, 1 p.m. Collected by Dr. A. J. Spiller. Brandon. Fly: Black Hackle. Hemiptera: 1 *Corixa* sp. Trichoptera: 6 caddis-cases (sand). Odonata: wings of Zygopterid dragonflies.

No. 22.— ♀, 1 lb.; 26 December, 1935, 12·30 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 1 *Anoplognathus pectoralis*. Hemiptera: 2 *Corixa* sp. Trichoptera: 27 caddis-cases (sand).

No. 23.— ♀, 1½ lb.; 26 December, 1935, 2 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Red Cocky. Hemiptera: 9 *Corixa* sp., 1 *Gerris* sp. Trichoptera: 2 caddis-cases (sand), 2 caddis-cases (stick). Odonata: 1 Anisopterid nymph, 1 Zygopterid nymph.

No. 24.— ♀, 1 lb.; 26 December, 1935, 5 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Red Palmer. Trichoptera: 49 caddis-cases (sand).

No. 25.— ♀, 1¼ lb.; 27 December, 1935, 12·30 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Red Cocky. Coleoptera: 1 *Anoplognathus pectoralis*, 3 Click beetles (Elateridæ; ? gen. et sp.), 2 Chrysomelid beetles (? gen. et sp.). Hemiptera: 1 Jassid (? gen. et sp.). Hymenoptera: 1 Saw-fly (*Perga ferruginea*). Trichoptera: 217 caddis-cases (sand).

No. 26.— ♀, 1 lb.; 27 December, 1935, 11·15 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Red Cocky. Coleoptera: 12 *Phyllotocus navicularis*, 1 *Anoplognathus pectoralis*, 1 Dung beetle (*Onthophagus granulatus*), 1 *Aphodius* sp., 1 *Cadmus* sp. Hemiptera: 1 cicada (*Melampsalta encausta*). Trichoptera: 63 caddis-cases (sand), 2 caddis-cases (stick). Lepidoptera: 1 moth (? gen. et sp.). Diptera: Head of fly. Miscellaneous insects: quantity of broken and unidentifiable insects remains.

No. 27.— ♀, 1¼ lb.; 28 December, 1935, ·7 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 5 *Phyllotocus navicularis*, 1 *Anoplognathus pectoralis*, 1 *Liparetrus* sp. 1 small Dytiscid beetle (? gen. et sp.). Hemiptera: 1 Jassid (? gen. et sp.). Hymenoptera: 1 bee (? *Halictus* sp.). Trichoptera: 4 caddis-cases (sand). Ephemeroptera: 1 mayfly nymph. Diptera: 1 Bombyliid fly (? gen. et sp.), 1 Stratiomyid fly (*Odontomyia* sp.), 1 Mycetophyllid midge (? gen. et sp.). Amphibia: bones of small frog. Crustacea: 1 shrimp (*Paratya australiensis*).

No. 28.— ♂, 2½ lb.; 28 December, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Odonata: wings of Zygopterid dragonflies. Crustacea: 1 shrimp (*Paratya australiensis*).

No. 29.— ♀, 1½ lb.; 30 December, 1935, 5 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 2 *Liparetrus* sp. Lepidoptera: 1 moth (? gen. et sp.). Diptera: 1 Mycetophyllid midge (? gen. et sp.). Miscellaneous: quantity of mud.

No. 30.— ♀, 2 lb.; 31 December, 1935, 1 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 1 *Anoplognathus pectoralis*, 4 *Cryptocephalus* sp., 1 *Liparetrus* sp., 1 *Phyllotocus navicularis*, 1 Carab beetle (*Clivinia* sp.), 1 Clerid beetle (? gen. et sp.). Hemiptera: 6 cicadas (*Melampsalta* sp.), and large quantity of remains, 1 Jassid (? gen. et sp.). Hymenoptera: 1 Ichneumon wasp (? gen. et sp.), 1 wasp (*Pison* sp.). Trichoptera: 1 caddis-case (stick). Odonata: 1 Anisopterid nymph, wings of Zygopterid dragonflies. Perlaria: 1 Stone-fly (? gen. et sp.).

No. 31.— ♂, 2½ lb.; 31 December, 1935, 6·30 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Red Cocky. Coleoptera: 137 *Phyllotocus navicularis*, 1 *Heteronyx* sp., 2 Christmas beetles (*Anoplognathus pectoralis*), 1 Cistelid beetle (? gen. et sp.), 5 Click beetles (Elateridæ; ? gen. et sp.), and a large quantity of coleopterous remains, mainly *Phyllotocus*. Hymenoptera: 1 Thynnid wasp ♀ (? gen. et sp.).

No. 32.— ♀, 1½ lb.; 31 December, 1935, 2·30 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Red Cocky. Coleoptera: 1 Lampyrid beetle (? gen. et sp.), 1 beetle without elytra. Hemiptera : 5 cicadas (*Melampsalta* sp.), 2 *Corixa* sp. Hymenoptera: 1 Thynnid wasp (? gen. et sp.). Neuroptera: 1 *Chrysopa* ? *ramburi*. Trichoptera: 8 caddis-flies and a large quantity of wings, etc., 6 caddis-cases (sand). Odonata: 1 Anisopterid nymph. Diptera: 1 crane-fly (*Gynoplistia* sp.). Miscellaneous insects: very large quantity of unidentifiable insect remains. Vermes: 1 Gordian worm.

No. 33.— ♀, 2 lb.; 1 January, 1935, 12 (noon). Collected by Dr. A. J. Spiller Brandon. Fly: Small Brown Palmer. Coleoptera: 1 *Anoplognathus viridæneus*, 1 *Heteronyx* sp., 1 large Click beetle (? gen. et sp.), 3 small Click beetles (Elateridæ; ? gen. et sp.), 1 *Paropsis* sp., 1 *Liparetrus* sp., 1 *Phyllotocus* sp., 1 *Cryptocephalus* sp., 1 *Anoplognathus pectoralis*, 1 Chrysomelid beetle (? gen. et sp.). Hemiptera: 1 Tree-hopper (Cercopidæ; ? gen. et sp.), Head of cicada (*Melampsalta* sp.). Hymenoptera: 1 ant (Dorylinæ). Odonata: wings of Zygopterid dragonflies. Miscellaneous insects. Quantity of finely broken and unidentifiable insect remains. Araneidæ: 1 spider (*Epeira* sp.). Vermes: 1 Gordian worm.

No. 34.— ♂, 3½ lb.; 2 January, 1935, 4·30 p.m. Collected by Dr. A. J. Spiller, Brandon. Fly: Black Hackle. Coleoptera: 7 *Anoplognathus pectoralis*, 6 *Phyllotocus navicularis*, 1 *Heteronyx* sp., 1 Click beetle (? gen. et sp.). Hymenoptera: 1 Thynnid wasp ♂ (? gen. et sp.). Trichoptera: 16 caddis-cases (sand), 1 caddis-case (stick). Diptera: 1 large Asilid fly (*Neoaratus* sp.).

No. 35.— ♀, 2 lb.; 2 January, 1935, 12·30 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Pennell Hackle. Coleoptera: 1 Christmas beetle (*Anoplognathus pectoralis*), 9 *Phyllotocus navicularis*, 1 Chrysomelid beetle (? gen. et sp. . Hymenoptera: 1 winged ant (? *Iridomyrmex* sp.). Odonata: 2 Anisopterid dragonflies ♂ and ♀, 5 Zygopterid dragonflies (imagines). Ephemeroptera: 4 mayflies. Isoptera: 1 winged termite (*Coptotermes* sp.). Amphibia: bones of a frog.

No. 36.— ♂, 3 lb.; 2 January, 1935, 4·30 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 3 *Anoplognathus pectoralis*, 1 *Heteronyx* sp., and a small quantity of coleopterous remains. Hymenoptera: 1 winged ant (? gen. et sp.). Diptera: 1 Bombyliid fly (? gen. et sp.). Perlaria: 2 Stone-flies (? gen. et sp.).

No. 37.— ♂, 3 lb.; 2 January, 1935, 5 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Red Cocky. Coleoptera: 8 Christmas beetles (*Anoplognathus pectoralis*), 9 *Heteronyx* sp., 2 *Phyllotocus navicularis*, 2 Tenebrionid beetles (*Adelium* sp.), 1 Cistelid beetle (? gen. et sp.), and small quantity of coleopterous remains. Hymenoptera: 1 Thynnid wasp ♂ (? gen. et sp.). Orthoptera: 1 grasshopper (Acridiidæ; *Gastrimargus musicus*). Lepidoptera: 1 moth (? gen. et sp.). Trichoptera: 3 caddis-cases (sand). Vermes: 1 Gordian worm.

No. 38.— ♂, 3¼ lb.; 3 January, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 30 Christmas beetles (*Anoplognathus pectoralis*), and stomach crammed with broken remains, 1 *Heteronychus* ? *pru'nosus*.

No. 39.— ♂, 2¼ lb.; 4 January, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. NOTE.—"Murphys." Coleoptera: 7 *Phyllotocus navicularis*, 1 *Aulococyclus* sp. Odonata: 20 Zygopterid dragonflies (imagines), 4 Zygopterid nymphs.

No. 40.— ♀, 2¾ lb.; 7 January, 1935, 10·30 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 1 Christmas beetle (*Anoplognathus pectoralis*), 1 *Diphucephala* sp. Diptera: 1 fly (? gen. et sp.).

No. 41.— ♀, 3 lb.; 12 January, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 11 Christmas beetles (*Anoplognathus pectoralis*), 15 *Phyllotocus navicularis*, 1 Tenebrionid beetle (*Adelium* sp.), 1 *Heteronyx* sp.

No. 42.—♂, 1½ lb.; 13 January, 1935, 1 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. NOTE.—River rose 1 ft. during the night (raining). Coleoptera: 2 Christmas beetles (*Anoplognathus pectoralis*), 1 weevil (*Belus* sp.).

No. 43.— ♀, 1¼ lb.; 19 January, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Pennel Hackle. Coleoptera: 22 *Phyllotocus navicularis*, 1 *Cryptocephalus* sp., 1 Jewel beetle (*Stigmodera* sp.) Trichoptera: 33 caddis-cases (sand). Perlaria: 1 Stone-fly nymph.

No. 44.— ♀, 1 lb.; 19 January, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Pennell Hackle. Coleoptera: 62 *Phyllotocus navicularis*, 1 Jewel beetle (*Stigmodera* sp.), 1 Click beetle (Elateridæ; ? gen. et sp.), 1 Cistelid beetle (? gen. et sp.), 1 *Heteronyx* sp. Trichoptera: 6 caddis-cases (sand). Diptera: 1 Bombyliid fly (? gen. et sp.), 1 Stratiomyid fly (*Odontomyia* sp.). Miscellaneous insects: quantity of broken and unidentifiable insect—remains.

No. 45.— ♂, 1½ lb.; 21 January, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 1 Click beetle (? gen. et sp.), 2 *Phyllotocus navicularis*. Hemiptera: 1 *Corixa* sp. Trichoptera: 53 caddis-cases (sand). Odonata: 2 Zygopterid dragonflies (imagines), 1 Zygopterid nymph. Miscellaneous insects: quantity of unidentifiable insect remains.

No. 46.— ♀, 1¼ lb.; 26 January, 1935, 1 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 12 *Phyllotocus navicularis*, 1 Click beetle (Elateridæ; ? gen. et sp.), 2 Chrysomelid beetles (? gen. et sp.). Hemiptera: 1 *Corixa* sp. Trichoptera: 1 caddis-case (sand).

No. 47.— ♀, 1¼ lb.; 2 February, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Coleoptera: 2 Christmas beetles (*Anoplognathus pectoralis*). Trichoptera: 1 caddis-case (sand). Araneidæ: 1 spider (*Araneus* sp.).

No. 48.— ♀, 1 lb.; 3 February, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Ephemeroptera: 1 mayfly nymph. Crustacea: 1 shrimp (*Paratya australiensis*).

No. 49.— ♀, 1 lb.; 3 February, 6 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Black Hackle. Hemiptera: 12 *Corixa* sp. Trichoptera: 11 caddis-cases (sand). Odonata: 2 Zygopterid nymphs.

No. 50.— ♀, 1½ lb.; 9 February, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Pennell Hackle. Coleoptera: 2 *Paropsis* larvæ, 3 Dryopid larvæ. Hemiptera: 2 Jassids (? gen. et sp.). Trichoptera: 2 caddis-cases (sand).

No. 51.— ♂, 1½ lb.; 11 February, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Pennell Hackle. Note.—Heavy fresh in river. Coleoptera: 1 Dynastid beetle (? gen. et sp.). Trichoptera: 6 caddis-cases (stick). Vegetable matter: leaves and vegetable matter.

No. 52.— ♂, 1½ lb.; 15 February, 1935, 6 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Pennell Hackle. Note.—River dropping after fresh. Trichoptera: 9 caddis-cases (sand), 1 caddis-case (stick). Vegetable matter: grass-stem 8½ inches in length.

No. 53.— ♀, 1½ lb.; 16 February, 1935, 11·30 a.m. Collected by Dr. A. J. Spiller Brandon. Coleoptera: 1 Hydrophylid beetle (? gen. et sp.). Trichoptera: 5 caddis-cases (sand). Amphibia: 2 frogs (1 very large, 1 small).

No. 54.— ♂, 4 lb.; 16 February, 1935, 12·30 p.m. Collected by Dr. A. J. Spiller Brandon. Fly: Pennell Hackle. Note.—Fish were tailing all over the river. Coleoptera: 2 *Heteronyx* sp., 2 *Aphodius* sp. Hemiptera: 2 Tree-hoppers (*Ledromorpha* sp.). Diptera: 1 Rutiliid fly (*Rutilia ? splendida*), 4 Mycetophyllid midges (? gen. et sp.).

No. 55.— ♀, 2¼ lb.; 17 February, 1935, 11·45 a.m. Collected by Dr. A. J. Spiller Brandon. Coleoptera: 1 *Heteronyx* sp.

No. 56.— ♀, 1¼ lb.; 18 February, 1935, 11·35 a.m. Collected by Dr. A. J. Spiller Brandon. Coleoptera: 1 *Heteronychus* sp., remains of a large beetle (? gen. et sp.). Hemiptera: 1 Reduviid bug (? gen. et sp.). Hymenoptera: 36 winged ants ♂ and ♀ (? *Iridomyrmex* sp.), 1 bee (*Halictus* sp.). Orthoptera: 1 cricket (*Gryllus servillei*), 1 immature grasshopper (Acridiidæ). Trichoptera: 13 caddis-cases (sand). Odonata: 1 Anisopterid dragonfly (imago), 8 Zygopterid dragonflies (imagines). Ephemeroptera: 2 mayflies. Isoptera: 19 winged termites (*Coptotermes* sp.) and stomach crammed with wings. Miscellaneous insects: quantity of unidentifiable insect remains Araneidæ: 1 spider (? gen. et sp.). Vermes: 1 Gordian worm.

No. 57.— ♀, 1½ lb.; 18 February, 1935, 12 (noon). Collected by Dr. A. J. Spiller Brandon.—Coleoptera: 6 Scarabæid beetles (*Prochelyna assimilis*), 1 *Polystigma octopunctata*, 5 *Heteronychus* sp., 5 *Litochrus* sp., 1 *Paropsis* larva, 1 Soldier beetle (*Telephorus pulchellus*), 1 *Diphucephala* sp. Hymenoptera: 2 winged ants ♂ and ♀ (? gen. et sp.). Trichoptera: 5 caddis-cases (sand), 2 caddis-cases (stick). Diptera: 1 *Bibio* sp., 1 Mycetophyllid midge. Isoptera: 1 winged termite. Miscellaneous insects: large quantity of finely broken and unidentifiable insect fragments. Miscellaneous: 2 feathers.

No. 58.— ♀, 1 lb.; 18 February, 1935, 1 p.m. Collected by Dr. A. J. Spiller Brandon. —Coleoptera: 2 *Liparetrus* sp., 1 Click beetle (Elateridæ; ? gen. et sp.), 1 *Heteronychus* sp., 1 *Diphucephala* sp., 1 *Cryptocephalus* sp. Hymenoptera: 8 winged ants (? gen. et sp.). Trichoptera: 47 caddis-cases (sand), 4 caddis-cases (stick), 1 caddis-fly (imago). Lepidoptera: 1 moth (? gen. et sp.). Odonata: 1 Anisopterid dragonfly (imago), 8 Zygopterid dragonflies (imagines). Ephemeroptera: 3 mayflies. Diptera: 1 Asilid fly (? gen. et sp.). Miscellaneous insects: small quantity of remains.

No. 59.— ♂, 1 lb.; 28 February, 1935, 1·30 p.m. Collected by Dr. A. J. Spiller Brandon.—Crustacea: 1 claw of small Yabbie (*Parachæraps bicarinatus*).

Lithgow District.

No. 60.—? sex, ? weight; 18 March, 1935. Fish River. Collected by Lithgow Trout Fishermen's Association.—Trichoptera: 1 caddis-case (sand). Odonata: 3 small Anisopterid nymphs.

No. 61.— ♂, 1 lb.; 20 March, 1935. Fish River. Collected by Lithgow Trout Fishermen's Association.—Coleoptera: 1 small Hydrophyllid larva. Hemiptera: 1 *Corixa* sp.

No. 62 — ♂, ¾ lb.; 20 March, 1935. Fish River. Collected by Lithgow Trout Fishermen's Association. Coleoptera: 1 large Hydrophyllid larva. Trichoptera: 23 caddis-cases (sand). Odonata: 1 large Anisopterid nymph.

No. 63.—? sex, ? weight; 20 March, 1935. Fish River. Collected by Lithgow Trout Fishermen's Association.—NOTE.—empty.

No. 64.— ♂, 1 lb.; 4 January, 1935. Tarana Quarries. Collected by Lithgow Trout Fishermen's Association.—Hemiptera: 2 *Corixa* sp. Hymenoptera: 1 winged ant (*Iridomyrmex* sp.). Trichoptera: 1 caddis-case (sand). Odonata: 2 Anisopterid dragonflies (imagines), 1 Anisopterid nymph.

No. 65.— ♀, 2¼ lb.; 27 December, 1934. Tarana Quarries. Collected by Lithgow Trout Fishermen's Association.—Coleoptera: 3 Christmas beetles (*Anoplognathus ? pectoralis*), 13 small *Heteronyx* sp., 1 Dung beetle (*Onthophagus granulatus*). Lepidoptera: 1 moth (? gen. et sp.).

No. 66.— ♀, 1¼ lb.; 31 December, 1934. Tarana Quarries. Collected by Lithgow Trout Fishermen's Association.—Coleoptera: 1 small *Heteronyx* sp. Hymenoptera: 1 ant (*Camponotus nigriceps*). Diptera: head of fly.

No. 67.— ♂, 2 lb.; 11 January, 1935. Tarana Quarries. Collected by Lithgow Trout Fishermen's Association.—Coleoptera: 1 Christmas beetle (*Anoplognathus porosus*). Orthoptera: 1 large grasshopper (Acridiidæ; *Gastrimargus musicus*). Odonata: 1 large Anisopterid nymph.

Summary of Stomach Contents of Brown Trout (*Salmo fario* Linnæus).

Stomach No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Coleoptera—																	
Scarabæidæ	...	...	...	5	1	...	...	...	...	...	3	...	...	...	...	18	...
Elateridæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Crysomelidæ	1	...	1	22	3	10	...	...	...	...	1	1	5	...	...	1	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Histeridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Lampyridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Buprestidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...
Cistelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hydrophylidæ	...	...	...	...	...	1	1	...	1	...	...	...	...	...	...	...	...
Rhipidoceridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	*	...	...	...
Hemiptera—																	
Pentatomidæ	2	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jassidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Capsidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Corixiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Cicadidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Hymenoptera—																	
Formicidæ	...	...	...	5	1	...	...	4	1	1	3	...	1	2	3	...	...
Apidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Tenthredinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vespidæ, etc.	...	...	...	...	1	...	...	...	...	...	...	...	...	1	...	...	...
Orthoptera—																	
Acridiidæ	...	...	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...
Gryllidæ	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
Trichoptera	...	6	...	...	...	8	1	1	2	...	...	1	1	...	4	14	27
Lepidoptera	...	...	...	...	...	...	...	...	...	...	1	...	...	...	2	...	...
Odonata—																	
Anisoptera	1	2	...	2	...	5	...	...	...	...	1	...	1	2	3	1	...
Zygoptera	...	...	...	...	1	...	...	...	1	2	...	1	...	...	...	3	14
Ephemeroptera	3	...	...	5	3	2	...	1	...	...	2	...	1	...	...	3	...
Neuroptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Diptera—																	
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bombylidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	*	...	...	...	...
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Isoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	...	...	*	...	...	...	*	...	...	*	...	...	...	*	*	*
Arachnida—																	
Araneidæ	1	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...
Acarina	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Vermes	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	2
Amphibia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reptilia	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Crustacea	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Brown Trout (*Salmo fario* Linnæus)—*continued.*

Stomach No.	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Coleoptera—																	
Scarabæidæ	4	2	2	...	1	...	...	1	15	7	...	2	3	140	...	5	14
Elateridæ	...	2	1	...	...	...	...	3	...	...	...	...	...	5	...	4	1
Chrysomelidæ	...	1	...	...	...	...	...	2	1	...	...	...	4	...	...	2	...
Curculionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Histeridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Tenebrionidæ	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Buprestidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cistelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Hydrophylidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rhipidoceridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Hemiptera—																	
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jassidæ, etc.	...	...	...	...	...	...	...	1	...	1	...	...	1	...	...	1	...
Capsidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Corixiidæ	...	...	...	1	2	9	...	...	...	...	...	...	...	...	2	...	...
Gerridæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Cicadidae	...	...	...	...	...	...	...	...	1	...	...	...	6	...	5	1	...
Hymenoptera—																	
Formicidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Apidæ	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Tenthredinidæ	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	1
Vespidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Orthoptera—																	
Acridiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gryllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	17	7	124	6	27	4	49	217	63	4	...	...	11	...	14	...	16
Lepidoptera	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...
Odonata—																	
Anisoptera	...	...	...	...	...	1	...	...	...	...	...	...	1	...	1	...	...
Zygoptera	...	...	...	*	...	1	...	...	...	...	1	...	*	...	...	*	...
Ephemeroptera	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Neuroptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Diptera—																	
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Bombylidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	*	...	...	...	...	...	...	...	...
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Isoptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	*	...	...	...	...	...	...	...	...	...	...	...	...	*	*	...
Arachnida—																	
Araneidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Acarina	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermes	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...
Amphibia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reptilia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...
Miscellaneous	...	...	...	...	...	...	...	...	...	...	...	*	...	...	...	...	...

* Indicates presence.

Summary of Stomach Contents of Brown Trout (*Salmo fario* Linnæus)—*continued.*

Stomach No.	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Coleoptera—																	
Scarabæidæ	10	4	19	31	8	2	27	2	22	63	2	12	2	...	...	...	1
Elateridæ	...	...	...	...	...	...	...	...	...	1	1	1	...	...	...	...	...
Chrysomelidæ	1	...	...	...	...	...	...	...	...	...	...	2	...	...	...	2	...
Curculionidæ	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Histeridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lampyridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenebrionidæ	...	...	2	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Buprestidæ	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cistelidæ	...	...	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hydrophylidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rhipidoceridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hemiptera—																	
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reduviidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Jassidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...
Capsidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Corixiidæ	...	...	...	...	...	...	...	...	...	...	1	1	...	...	12	...	...
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cicadidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hymenoptera—																	
Formicidæ	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Apidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tenthredinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Thynnidæ	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vespidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Orthoptera—																	
Acridiidæ	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gryllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blattidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trichoptera	...	...	3	...	...	...	...	...	33	6	53	1	1	...	11	2	6
Lepidoptera	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Odonata—																	
Anisoptera	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Zygoptera	5	...	...	...	24	...	...	...	...	...	3	...	...	...	2	...	...
Ephemeroptera	4	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Neuroptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Diptera—																	
Tachinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tipulidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mycetophyllidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stratiomyidæ	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Asilidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bombylidæ	...	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
Bibionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Unidentifiable	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Perlaria	...	2	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Isoptera	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miscellaneous Insects	...	...	...	...	...	...	...	...	...	*	*	...	...	...	...	...	...
Arachnida—																	
Araneidae	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Acarina	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vermes	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Amphibia	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reptilia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crustacea	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Miscellaneous	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	*

* Indicates presence.

Summary of Stomach Contents of Brown Trout (*Salmo fario* Linnæus)—*continued.*

Stomach No.	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	Total.
Coleoptera—																	
Scarabæidæ	...	...	4	1	1	18	4	...	...	...	...	...	...	17	1	1	475
Elateridæ	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	22
Chrysomelidæ	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	62
Curculionidæ	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	2
Dryopidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Carabidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Histeridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Lampyridæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	3
Tenebrionidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Buprestidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Dytiscidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Gyrinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Cistelidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
Cleridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Hydrophylidæ	...	1	...	...	...	...	...	...	...	1	1	...	...	...	...	...	6
Rhipidoceridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Unidentifiable	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Hemiptera—																	
Pentatomidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
Reduviidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Jassidæ, etc.	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	8
Capsidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Corixiidæ	...	...	...	...	...	...	...	...	...	1	...	...	2	...	...	...	31
Gerridæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Cicadidæ	...	...	...	...	...	...	...	...	...	...	. .	...	...	...	...	...	14
Hymenoptera—																	
Formicidæ	...	...	...	...	36	2	8	...	...	...	...	...	1	...	1	...	73
Apidæ	...	...	...	...	1	...	...	...	...	...	...	..	...	...	...	...	4
Ichneumonidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Tenthredinidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Thynnidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Vespidæ, etc.	...	...	...	...	...	...	...	...	...	...	...	..	...	...	..	...	3
Orthoptera—																	
Acridiidæ	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	4
Gryllidæ	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	4
Blattidæ	...	...	...	...	...	..	...	...	...	...	...	...	..	...	...	...	1
Trichoptera	10	5	...	...	13	7	52	...	1	...	23	...	1	...	...	...	842
Lepidoptera	...	...	...	...	...	...	1	...	...	...	...	...	...	1	...	...	8
Odonata—																	
Anisoptera	...	...	...	...	1	...	1	...	3	...	1	...	3	...	...	1	33
Zygoptera	...	...	...	...	8	...	8	...	...	...	...	...	...	...	...	...	74
Ephemeroptera	...	...	...	...	2	...	3	...	...	...	...	...	...	...	...	...	31
Neuroptera	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	. .	1
Diptera—																	
Tachinidæ	...	...	1	...	...	...	...	...	...	..	...	...	...	...	...	..	1
Tipulidæ	...	...	...	..	...	..	...	...	...	...	..	...	...	...	...	...	1
Mycetophyllidæ	...	...	4	...	...	1	...	..	..	...	...	...	...	...	...	...	8
Stratiomyidæ	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	2
Asilidæ	...	...	...	...	...	...	1	...	...	...	...	...	...	. .	...	...	2
Bombylidæ	...	...	...	...	...	...	...	..	..	...	...	...	...	...	. .	...	3
Bibionidæ	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1
Unidentifiable	...	...	. .	...	...	...	...	...	...	...	...	...	...	..	1	...	3
Perlaria	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	4
Isoptera	...	...	...	...	19	1	...	...	. .	...	...	...	...	...	..	...	21
Miscellaneous Insects	...	...	...	...	*	*	*	...	...	...	...	...	...	...	...	...	*
Arachnida—																	
Araneidæ	...	...	...	...	1	...	...	...	...	. .	..	...	...	...	...	..	6
Acarina	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	1
Vermes	...	...	...	...	1	...	...	...	...	...	..	...	...	...	...	...	7
Amphibia	...	2	...	...	...	...	...	...	...	..	...	...	...	...	..	...	4
Reptilia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Crustacea	...	...	...	...	...	...	...	1	...	..	...	...	...	...	...	...	4
Miscellaneous	*	...	...	...	...	*	...	...	...	. .	...	...	...	...	..	...	*

* Indicates presence.

Stomach Contents of Loch Leven Trout.

(*Salmo levenensis* Walker.)

Tuross River.

No. 1.— ♀, 1½ lb.; 16 February, 1935, 11 a.m. Collected by Dr. A. J. Spiller Brandon. Fly: Pennell Hackle. Coleoptera: 1 Clerid beetle (? gen. et sp.). Hemiptera: 3 Tree-hoppers (*Eurymela* sp.). Hymenoptera: 1 Ichneumon wasp (? gen. et sp.), 1 Eumenid wasp (? gen. et sp.), 1 wasp (Vespidæ; ? gen. et sp.), 1 Braconid wasp (? gen. et sp.). Odonata: wings of Zygopterid dragonflies. Ephemeroptera: wings of mayflies. Diptera: 164 Mycetophyllid midges (? gen. et sp.). Thysanoptera: 1 Giant Thrips (*Idolothrips spectrum*). Araneidæ: 1 spider (*Epeira* sp.). Amphibia: 1 frog.

Lithgow District.

No. 2.— ♂, ¾ lb.: 20 March, 1935. Fish River. Collected by Lithgow Trout Fishermen's Association.—Orthoptera: 1 long-horned grasshopper (? gen. et sp.). Trichoptera: 2 caddis-cases (sand).

No. 3.— ♀, 1 lb.; 20 March, 1935. Fish River. Collected by Lithgow Trout Fishermen's Association.—Hymenoptera: 20 winged ants (*Iridomyrmex* sp.), 1 bee (*Anthophora* sp.). Orthoptera: 1 long-horned grasshopper (Tettigoniidæ), 1 grasshopper (Acridiidæ; *Chortoicetes* sp.). Trichoptera: 4 caddis-cases (sand). Ephemeroptera: 1 mayfly and remains of others. Vermes: 2 Gordian worms. Miscellaneous: quantity of feathers.

No. 4.— ♀, ¾ lb.; 20 March, 1935. Fish River. Collected by Lithgow Trout Fishermen's Association.—Hymenoptera: 1 winged ant (*Iridomyrmex* sp.). Orthoptera: 1 grasshopper (Acridiidæ; ? gen. et sp.). Miscellaneous insects: small quantity of insect remains. Vermes: 1 small Gordian worm. Miscellaneous: 1 feather. Vegetable matter: 2 pieces of stick measuring 1 inch in length.

No. 5.— ♀, ½ lb.; 26 December, 1934. Tarana Quarries. Collected by Lithgow Trout Fishermen's Association.—Trichoptera: 13 caddis-cases (sand).

No. 6.— ♀, ½ lb.; 26 December, 1934. Tarana Quarries. Collected by Lithgow Trout Fishermen's Association.—Coleoptera: remains of small beetle (? gen. et sp.).

No. 7.— ♀, ¾ lb.; 26 December, 1934. Tarana Quarries. Collected by Lithgow Trout Fishermen's Association.—NOTE: empty.

No. 8.— ♂, ¾ lb.; 22 December, 1934. Sodwalls Creek. Collected by Lithgow Trout Fishermen's Association.—Coleoptera: 1 small *Heteronyx* sp. Ephemeroptera: 10 mayflies.

Summary of Stomach Contents of Loch Leven Trout (*Salmo levenensis* Walker).

Stomach No.	1	2	3	4	5	6	7	8	Total.
Coleoptera—									
Scarabæidæ	...	...	...	...	...	...	...	1	1
Cleridæ	1	...	...	...	...	...	...	...	1
Unidentifiable	...	...	...	...	...	1	...	...	1
Hemiptera—									
Jassidæ, etc.	3	...	...	...	...	...	...	...	3
Hymenoptera—									
Formicidæ	...	...	20	1	...	...	...	...	21
Apidæ	...	...	1	...	...	...	...	...	1
Ichneumonidæ	1	...	...	...	...	...	...	...	1
Vespidæ, etc.	2	..	...	...	...	...	...	...	2
Braconidæ	1	...	...	...	...	...	...	...	1
Orthoptera—									
Acridiidæ	...	...	1	1	. .	...	...	...	2
Tettigoniidæ	...	1	1	...	...	...	...	...	2
Trichoptera	...	2	4	...	13	...	...	...	19
Odonata—									
Zygoptera	*	...	...	...	...	...	...	...	*
Ephemeroptera	*	...	1	...	...	...	...	10	11
Diptera—									
Mycetophyllidæ	164	...	...	...	...	...	...	...	164
Thysanoptera	1	...	...	...	...	...	...	...	1
Miscellaneous Insects	...	. .	..	*	...	...	...	...	*
Arachnida—									
Araneidæ	1	...	...	...	...	...	...	...	1
Vermes	...	...	1	1	...	...	...	...	2
Amphibia	1	...	...	...	...	...	...	...	1
Miscellaneous	...	...	*	*	...	...	...	...	*

* Indicates presence.

Sydney: David Harold Paisley, Government Printer—1936.

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